# NATUR CYMRU
## *Nature of Wales*

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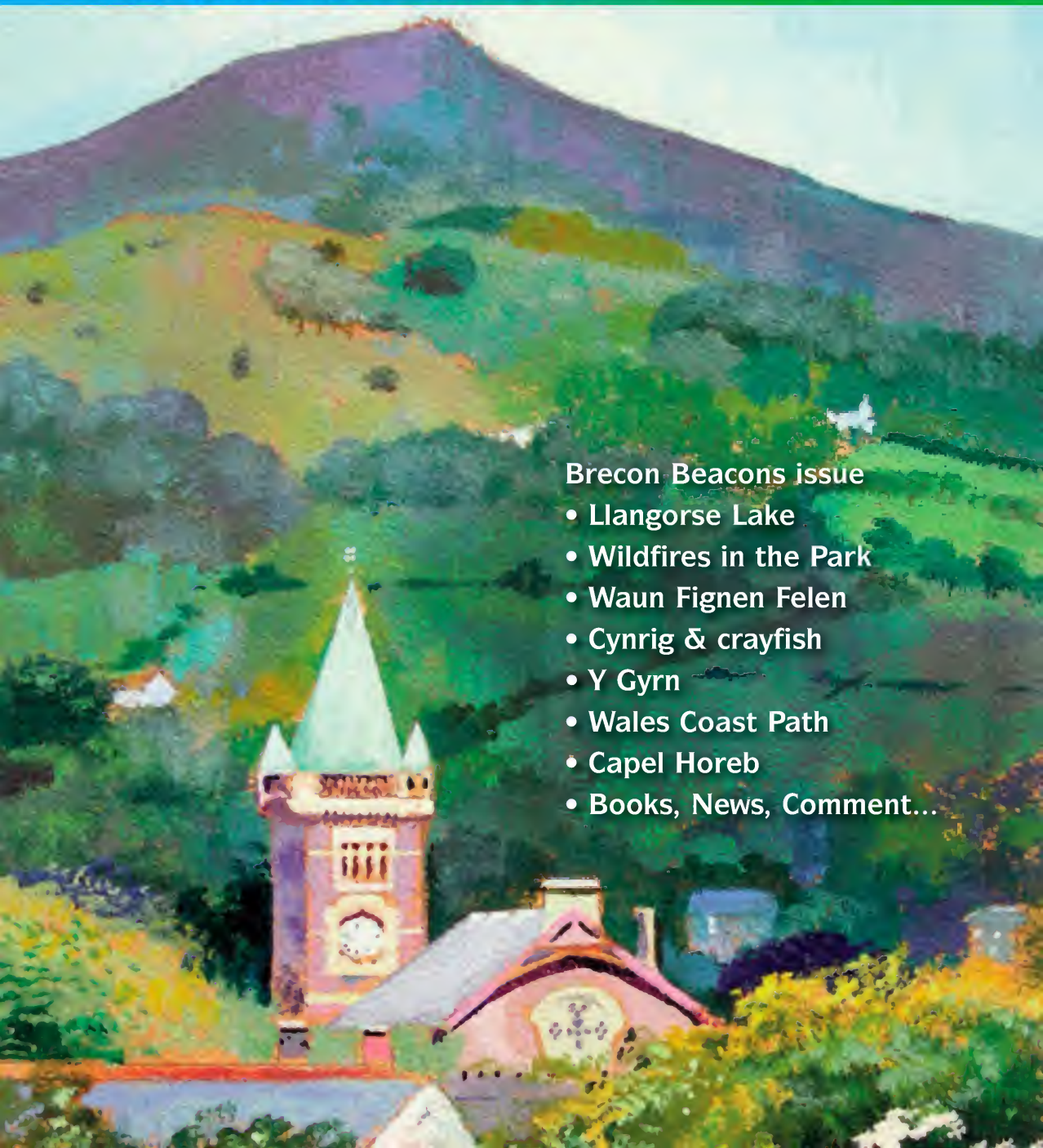

**Brecon Beacons issue**

- Llangorse Lake
- Wildfires in the Park
- Waun Fignen Felen
- Cynrig & crayfish
- Y Gyrn
- Wales Coast Path
- Capel Horeb
- Books, News, Comment...

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# NATUR CYMRU
## Nature of Wales

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*Natur Cymru* is intended to promote the exchange of information about biodiversity and encourage debate. If you have information, ideas for articles or artwork which you think might be of interest to readers, please contact the Editor.

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# NATUR CYMRU EDITORIAL GOLYGYDDOL

In this Brecon Beacons edition we have tried to include as much as possible but there were too many stories for the available space. If we have missed your subject please contact Jonathan Mullard, who is putting the final touches to the *New Naturalist* book on this special area (p 42).

Spring is especially busy this year, with the Government's 'Living Wales ' consultation underway. This is a radical re-think of the way we manage our natural resources (pp 38-41). It would be good if *Natur Cymru* readers engaged with the consultation to influence what happens next.

On 5th May the Wales Coast Path opens, connecting with the Offa's Dyke Path to create over 1000 miles of continuous trail. No doubt some will seek to complete it in the shortest time possible, but for myself, I think I'll take it at a steady, appreciative pace. Ten miles a day with a break on Sundays will take a mere seventeen weeks!

Sustainability applies not only to species and habitats but also to magazines. We have decided to sell a small amount of advertising space, limited to environmental education, and it is good to welcome back the Field Studies Council. They used to advertise 50 years ago in *Nature in Wales* and not surprisingly their prices have increased a bit since then. Plas Tan y Bwlch, and the universities of Aberystwyth and Bangor have all placed adverts. We have dropped the Noticeboard section, which contained much of the same information, and made use of the generally empty page on the inside back cover.

2012 is the centenary of the Wildlife Trusts movement, as the Society for the Promotion of Nature Reserves was established in 1912 and this was the spur for individual Trusts to be set up. So our next edition will have a Wildlife Trust theme.

***Huw Jenkins***
***Rheolwr Marchnata*** **Natur Cymru** ***Marketing Manager***

Yn y rhifyn yma, sy'n canolbwyntio ar Fannau Brycheiniog, rydym wedi ceisio cynnwys cymaint o straeon â phosibl – ond roedd 'na gynifer ohonyn nhw a dim digon o le. Os ydym wedi hepgor eich maes chi, cysylltwch â Jonathan Mullard – mae o ar fin gorffen ei lyfr *New Naturalist*, sydd hefyd yn sôn am yr ardal arbennig yma (t 42).

Mi fydd y gwanwyn yn gyfnod prysur dros ben, gydag ymgynghoriad 'Cymru Fyw' ar waith. Dyma ffordd newydd o ystyried sut y caiff ein hadnoddau naturiol eu rheoli (tn 38-41). Byddai'n dda o beth i ddarllenwyr *Natur Cymru* gymryd rhan yn yr ymgynghoriad er mwyn dylanwadu ar y dyfodol.

Ar 5 Mai bydd Llwybr Arfordir Cymru'n cael ei agor yn swyddogol. Trwy ei gysylltu â Llwybr Clawdd Offa ceir mwy na 1,000 milltir o lwybr di-dor. Yn ddi-os, bydd rhai â'u bryd ar ei gerdded mor gyflym â phosibl; ond mynd dow-dow wna' i a gwerthfawrogi'r golygfeydd godidog. Deg milltir y dydd gyda seibiant ar y Sul – dim ond 17 wythnos o gerdded!

Mae cynaliadwyedd yn bwysig nid yn unig i rywogaethau a chynefinoedd, ond hefyd i gylchgronau. Rydym wedi penderfynu gwerthu rhywfaint o le hysbysebu (yn ymwneud ag addysg amgylcheddol), a braf yw croesawu'r Cyngor Astudiaethau Maes yn ôl. Roedden nhw'n arfer hysbysebu hanner can mlynedd yn ôl yn *Nature in Wales*, ac nid yw'n syndod bod eu prisiau wedi codi ers hynny. Mae Plas Tan y Bwlch, Prifysgol Aberystwyth a Phrifysgol Bangor ill tri wedi hysbysebu. Rydym wedi cael gwared â'r adran Hysbysfwrdd (a oedd yn cynnwys yr un wybodaeth fwy neu lai) ac wedi gwneud defnydd o dudalen fewnol y clawr cefn sydd, fel arfer, yn wag.

Yn ystod 2012 bydd mudiad yr Ymddiriedolaethau Natur yn dathlu ei ganmlwyddiant, oherwydd yn 1912 cafodd y *Society for the Promotion of Nature Reserves* ei sefydlu – sef rhagflaenydd yr Ymddiriedolaethau unigol. Thema'r rhifyn nesaf, felly, fydd 'Ymddiriedolaethau Natur'.

# FIFTY YEARS AGO

## National Nature Reserves: 74 hidden treasures

***SUE PARKER** has visited all the National Nature Reserves in Wales and created a website that aims to encourage more people to visit and appreciate what each has to offer.*

NEW NATIONAL NATURE RESERVES

(*from the Nature Conservancy*)

CWM CLYDACH, BRECONSHIRE

The beechwoods of Clydach Gorge in south-east Breconshire, within the Brecon Beacons National Park, have been established as a Nature Reserve by the Nature Conservancy with the co-operation of the Duke of Beaufort and his tenants. The Reserve, supporting a fine stand of mature Beech and stretching for about 1½ miles along

*Nature in Wales*, Volume 8 number 2, Winter 1962

Wales is a wildlife wonderland. With 74 National Nature Reserves (NNRs) – far more per capita than either England or Scotland – and many times that number managed by local authorities, Wildlife Trusts, RSPB and other conservation organisations, our countryside is also a paradise for wildlife enthusiasts. The tradition of nature conservation in Wales is distinguished by pioneering measures such as the designation of the Gower Peninsula as the UK's first Area of Outstanding Natural Beauty. Many of our wildlife habitats are so special that they are recognised by European and even worldwide designations, and some of our NNRs have been in existence for more than 60 years.

Currently the NNRs in Wales receive nearly three million visits per year. Sadly, that is not to say that most of the people who live in Wales know about and visit such places. Boardwalks and gravel paths through sensitive habitats ensure that people can visit many (but not all, of course) of our finest wildlife sites without jeopardising the features that make them special. Most of the boardwalks rot away long before they wear out. The majority of visits are to just a handful of NNRs, and the same is also likely to be true of most other nature reserves.

So many people simply travel through the countryside, perhaps enjoying the views but rarely if ever getting out on foot to see and learn about our wildlife, plants, fungi or geology. Only by making contact with it at close quarters can they gain any kind of understanding of what it takes to conserve wildlife and habitats – not just in financial terms but also in the sheer back-breaking hard work, much of it done by volunteers working alongside the professionals from our nature conservation organisations.

It is more than 20 years since I first worked as a volunteer, helping my local Wildlife Trust to restore a pond and maintain a woodland site. Beyond those narrow confines nature reserves had not been central to either my work or my leisure activities, despite a lifelong interest in wildflowers, in particular wild orchids. All that changed in 2002, following an almost accidental visit to Kenfig NNR, close to one of the schools I had attended as a youngster. To say that seeing the floral diversity of that coastal dune system was for me a life-changing experience is no

Razorbill on Skomer island

Sue Parker

Sue Parker

Parasol mushrooms at Morfa Dyffryn

Sue Parker

Marsh helleborine at Newborough Warren

exaggeration. I was amazed by what I saw, particularly when my focus shifted from ground level to the contrasting backdrop of the belching industrial chimneys of Port Talbot. I found it even more puzzling that in such a beautiful place right next to a large urban population I could wander for hours and rarely meet another soul.

Why had I been missing so much without being aware of it? And what could I do to help others enjoy such opportunities too? The answers to these questions set me on a path that eventually resulted in my building a new web-based wildlife resource for Wales – **www.waleswildlife.com**. With the legendary enthusiasm of a convert, I set about visiting other NNRs all across Wales, and I was immediately struck by how frequently I had these wildlife gems entirely to myself. Spending many frustrating hours in narrow lanes searching for entrances to reserves taught me why many of them get so few visitors: often signage is non-existent or so poor that it is an impediment rather than a help. Asking local people for help is rarely the answer. All too often even those living within a mile of an NNR have no idea that there are such riches so close to where they conduct their everyday lives.

Not being able to find the reserves is only one of the many deterrents to visitors. Like me, before my 'conversion on the road to Kenfig', many people don't really know what nature reserves are or why they are relevant to their present lives and to all our futures. If they visit an NNR, will it be interesting enough to keep the kids entertained? Could they take the whole family including Auntie Wendy who's in a wheelchair? If there's no way of getting there by public transport is there somewhere to park a car... to sit down... to have a picnic? Is there a nearby café, and what about the all important loos?

Whoever heard of somebody being unable to find their way to Alton Towers or Oakwood Park? It's so much easier to visit places where we know that the needs of the whole family will be catered for, even if the entrance fee means it can only be an occasional treat.

But hang on... why isn't the same true of our nature reserves? Many of them offer enjoyable, interesting and exciting days out free of charge, and many are close to large centres of populations where visits do not necessarily entail long journeys. And so we return to the practical questions of where, what and how. Answer these, and we remove most of the barriers that prevent our NNRs and other publicly accessible wildlife sites from becoming central to the lives of many more people.

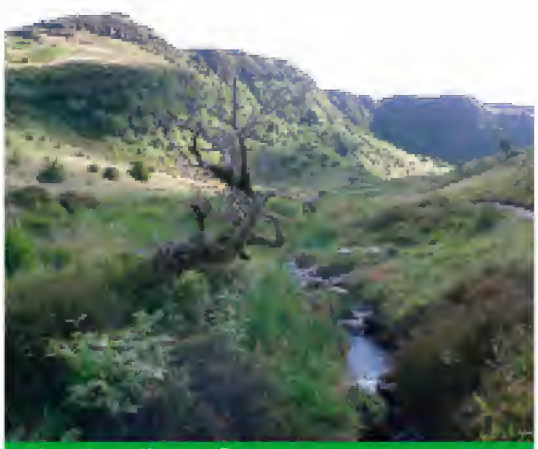
### Using the website

**www.waleswildlife.com** provides the information needed to plan and enjoy a day out with nature in Wales. Each nature reserve has its own page with descriptions and pictures of the wildlife you'll find when you get there. There are also grid references and maps backed up with written directions and

photographs taken along the access routes. There is information about the facilities either at the nature reserve or close by, and whether or not the access is easy, suitable for prams and wheelchairs or the kind of place you need to be equipped with crampons just to get out of the car park. If you have a special interest in plants, insects, birds, bugs, or just lovely landscapes, you can sort the list of nature reserves by 'interest'. Similarly if you live in or are staying in a particular part of Wales and want to know which reserves are closest, you can either sort them by 'area and county' or by 'nearest town' or find them from the area maps on introductory pages about the wildlife and ecology of north, south and east Wales. The new website is supported by links to species pages that help people to identify plants, birds and animals that they see during their days out.

Abraham Maslow said, *'If the only tool you have is a hammer, every problem looks like a nail'*. I worked in marketing and sales, so my hammer is publicity. We can ensure that many more people enjoy and value our nature reserves if we can help them to discover how wonderful these places are. There are obvious social and health benefits from getting out into the fresh air and having a good walk in wonderful surroundings. With more people learning about and valuing nature reserves, there will be a stronger voice urging Government not to cut Wales's investment in wildlife conservation. And for those who are only convinced by economic arguments there are much-needed jobs providing goods and services to wildlife tourists.

Sue Parker



Craig Cerrig Gleisiad a Fan Frynych NNR

The Welsh Government's decision to merge the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales into a single body may be largely driven by economic pressures, but it also presents Wales with an opportunity to refocus priorities and to capitalise on the natural environment in a way that has not been possible before. If we are to save nature in Wales, it must become more important to many more people. It's a case of safety in numbers. Cuts to funding for the environment are not new or driven only by the recent dire economic problems. Governments across the UK have cut national conservation budgets progressively over many years. The combined EU and Welsh Government funding of the Wales Coast Path, due to open in May, should not lull us into a false sense of security: the underlying trend is reduced spending on nature conservation.

High on my wish list for increasing visitor numbers to those reserves where additional footfall can be accommodated, without threatening the natural resources that make these places special, is better signage. In the meantime, being of the *'Don't moan about it, do something'* persuasion, my own visits to nature reserves serve two purposes. One is self-indulgent enjoyment of what I see and learn. The other is taking pictures so that I can go home and relive my experience by writing about it on waleswildlife.com, to help others find and enjoy more of the wonderful wildlife and ecology of Wales.

www.wildlifewales.com is dedicated to the many volunteers who turn out in all winds and weathers to work on the reserves. Thank you, from one of the few who appreciate what you do, and why, on behalf of the many who still do not.

***Sue Parker** is the author of several books on wildflowers, orchids and flyfishing. She is also Marketing Director of First Nature, a rich source of information and books on wildlife.*

Gareth Ellis

# Llangorse Lake

What lurks beneath?

*Neither science nor words can adequately describe Llangorse Lake.* ***GARETH ELLIS*** *does so very eloquently but urges you to see, hear and feel it for yourself.*

Among the peaks and plateaus of the Brecon Beacons there lies a hidden jewel, a shining pool fringed by walls of reeds, silent trees and swaying meadows. The air is filled with the sounds of reed and sedge warblers while swans and ducks dive and dabble on the surface, perhaps unaware of the huge pike lurking in the waters below. This is no wild moorland or upland forest. This is not a place of soaring kites and steep, windblown slopes. This is Llangorse Lake.

There is so much here it's difficult to know quite where to start. I could begin with its statutory designations, its rare species or any number of other scientific and ecological classifications, most described through acronyms and code. But I won't. The reduction to bare facts, dates, species and vegetation classes does little to capture the essence of the lake and its margins. For those of you who enjoy such details, much is available through your computer but the value and meaning of such data is diminished without observation and interpretation of the lake with our greatest scientific instruments; our eyes, ears and other senses.

Not so long ago this place was a frozen wasteland, a featureless expanse of ice. As the ice began its final retreat it pooled, creating a vast lake between the Beacons in the west and the Black Mountains in the east. At first, this water overflowed south into the River Usk at Bwlch. As the ice in the Wye valley to the north melted, the lake abandoned the Usk valley and gradually shrank, its water escaping into the Wye. What remains is a mere puddle compared to that vast, ancient and long gone lake.

Over 1km square and no more than 8m deep, the lake squats within a bowl of surrounding higher ground, the gentle slope of Allt yr Esgair to the south and towering Mynydd Llangorse to the east. It appears as if the water is determined to stay and not give way to the dry – an intruder trapped, or staging a determined sit-in within a place where it seems to have no right to be. Llangorse is no mountain lake, no gem of calm, cool serenity in the windswept uplands of Wales. It's a noisy, colourful, ever changing cauldron of vibrant, living energy; an untamed, shifting mass of water.

Its levels have not been controlled by sluices and flood walls. It hasn't been pinned into place by development or roads. It still has a life of its own: swelling after heavy rains, the lake tries to invade and conquer the land, washing into the surrounding fields only to be forced into retreat by clear skies. When the water recedes it always appears to do so reluctantly until the next time rain can drive its assault on the land.

It is these rains that bring in natural nutrients from the surrounding land, fuelling prolific growth of pondweed beneath the lake surface. There is a whole world under there, unseen by most and only really considered by the anglers who hunt the depths with line and lure. Reedbeds stand guarding the lake margins, their towering stems forming a dense thicket. There are plains of mud sculpted into dunes and slopes with stands of pondweed forming canopies of submerged, weedy forests. Beneath the surface of mud and leaf litter, countless insects crawl and hunt and fight, oblivious to the existence of a world beyond the lake. Or oblivious until those who can leave the water become adults and take their place in the world of sun and air. Ducks plunge down from the surface while pike patiently wait in the gloom for something tasty to drift through their pondweed forests. We are denied access to this strange world beneath the surface and can only imagine how the residents perceive it. Are they trapped beneath the water, excluded from the noise, warmth and sun above? Or is it a cool, calm refuge from the uncertainties of weather and seasons? Free to explore both worlds, perhaps it is only the ducks that know for sure, though so far they have been silent on the matter.

Melanie Davies

Warmer in than out

Where the water shallows the reeds climb out of the submersed world of weed and mud to form a wall of vegetation, as if trying as best they can to help hold the lake in its place. But the water periodically wins, oozing through the reeds and flooding the land behind. Those plants on the front lines must be prepared to cope with the regular advance of the

lake while those further behind are less prepared to become temporary residents of the underwater world. This living horde of plants has arranged itself, almost as if ordered to do so, in regular lines parallel to the lakeshore, each rank populated by plants progressively more tolerant of the lake's regular assaults on the land.

In scattered and isolated patches, reeds and sedges give way to forests of alder, willow and ash. These living giants tower over the lake and reeds, casting shade and shelter from the elements. The woodlands are shared by the otters that patrol the fallen trunks among muddy pools and the birds that dance and sing through the canopy, perhaps mocking both the otters and ourselves for our limited mobility.

Willows advance into the lake pushing out the reeds and filling the shallows with leaves. They are insurgents, driving out the wetland plants and filling the water to make more dry ground. The lakeshore has become a battle ground as the gnarled, wooden armies of the land try to take and hold ground from the waters of the lake every bit as much as the lake struggles in vain to conquer the land.

Above and between the massed ranks of vegetation live the birds that draw so many to visit the lake. Some live out their whole lives here while others are transient visitors, birds with a more pressing desire to be somewhere far, far away. Perhaps they view the lake as we view the services on the motorway; somewhere functional, in the right place and where

Gareth Ellis

you can rest and feed before resuming your journey. Caught between two upland ranges, Llangorse gleams from the air, a shining beacon promising food and shelter, an oasis amongst the peaks and rocks. Songbirds, waders, waterfowl and farmland birds can always be found on and around the lake, filling the air with chattering songs and calls.

Yet the birds don't get the skies above the shining lake to themselves. They must share it with the

Gareth Ellis

The lake floods well beyond the reed margins in winter

dragonflies and damselflies that emerge from the weedy waters in huge numbers each spring and summer. Tirelessly hawking over the wet margins or resting in the sedges and grasses, they seem to cover the greens, yellows and whites of the meadows and fens with the glitter of shimmering wings, an extension of the sunlight reflected from a million tiny waves on the lake.

It is impossible to capture the essence of this magical place in words. Certainly many of the technical documents and surveys regarding everything from nutrient levels to bird populations can't capture this essence, despite the value and understanding such science delivers. Perhaps it is best to accept that places like this have a magic that refuses to be chained to a page by blunt words. Words can't seem to capture how the light of a summer evening makes the reeds glow, or how the mist hovers over the lake in the crackling cold of a winter's morning. Wales is full of places like this. Their meaning can only be determined by what it means to the individual. And so it seems aimless for me to write more as you can only experience this place by seeing, hearing and feeling it for yourself. Once you have, you can decide what a place like Llangorse Lake means to you.

***Gareth Ellis** is Biodiversity Officer for the Brecon Beacons National Park Authority and a member of NATUR.*

Garnet Davies

## Llyn Syfaddan

Wedi'i ffurfio ar derfyn yr Oes Iâ ddiwethaf, dim ond Llyn Syfaddan sy'n weddill o lyn anferthol a ymestynnai o Fannau Brycheiniog i'r Mynyddoedd Du yn wreiddiol. Mae'n llyn naturiol tawel braf dros 1km sgwâr a hyd at 8m o ddyfnder, ac nid yw'r lefelau dŵr wedi'u rheoli gan lifddor na wal. Mae maethynnau sy'n llifo o'r caeau cyfagos yn golygu bod dyfrllys yn ffynnu o dan yr wyneb, gan gysgodi penhwyaid a phob math o fywyd gwyllt. Mae gwelyau cyrs yn creu dryslwyni trwchus ar ochrau'r llyn, ac mae planhigion ar y rheng flaen yn gorfod dioddef llifogydd cyson ar ôl glaw trwm. Mae coed gwern, helyg ac onnen wedi cymryd lle'r cyrs yma ac acw, gan gynnig cysgod i adar a dyfrgwn. I adar mudol, mae Llyn Syfaddan yn sgleinio o'r awyr, atynfa sy'n cynnig cysgod a bwyd. Mae'r rhywogaethau niferus hyn yn denu criw mawr o adarwyr.

Ni all dynodiadau statudol a dosbarthiadau gwyddonol ac ecolegol eraill fyth wneud cyfiawnder â'r profiad o fod yno go iawn: nid yw'r ffeithiau moel yn llwyddo i ddal naws arbennig y llyn a'r cyffiniau. Dyw gwerth ac ystyr data o'r fath yn golygu dim heb ddehongli a sylwi ar y llyn gyda'n hoffer gwyddonol gorau oll - ein llygaid, ein clustiau a'n synhwyrau eraill.

# Pipeline through the Park

All photos: BBNPA Graham Cowden/Wyn Morgan

*When planning permission was granted to locate the Liquid Natural Gas (LNG) terminals on the shores of Milford Haven it was inevitable that the gas would need to be piped somehow to the rest of the UK. Not before in Britain had a project to plan, consent and construct over 100km of 1200mm diameter steel gas pipeline been completed in the three year time limit.* ***GRAHAM COWDEN*** *describes the challenges of planning the pipeline for the National Grid and his subsequent role for the National Park overseeing construction and restoration.*

View west from Mynydd Myddfai near Llandovery

Commuting from Herefordshire to Carmarthen, as a member of the management team planning the south Wales gas pipeline projects, I enjoyed superb sunrises and sunsets framing the escarpments and peaks of the Brecon Beacons National Park. In 2004 I had no vision of attempting to route a pipeline through this stunning landscape. Furthermore, I never foresaw my personal journey eventually stopping in Brecon at the National Park Authority (NPA) where I took up the post of Conservation Officer in 2007, responsible for overseeing the construction and restoration of the pipeline. This swift transformation from poacher to gamekeeper gave me a unique and at times unpopular insight into the delivery of the huge infrastructure project that would become the Felindre to Tirley natural gas pipeline.

As Environmental Manager for the project I had responsibility for promoting the planning from initial feasibility through to the application for Secretary of State (SoS) consent. Just over 12 months to achieve this objective gives you little time to stop and think. However, one question did repeatedly resonate: why is the UK energy infrastructure delivered in this apparently absurd way?

## Gas auctions

The delivery of gas pipelines is a reactive process, whereby the gas transporter, in this case National Grid, responds to market signals from annual 'gas auctions'. If the gas transporter accepts a signal, they are contracted to plan and construct the pipeline within a period dictated by Ofgem, the energy regulator. At the time of the south Wales projects the regulatory period was 36 months. The fact that the independent consortium of shippers chose the deep water port of Milford Haven, with no large scale pipeline connections in proximity (unlike the shores around Aberdeen) put the writing on the wall. This would need to be a big pipe.

At the time of the first auction the nearest large pipelines were north of Swansea, and thus the Milford Haven to Aberdulais pipeline was conceived. Unfortunately this laid some constraining foundations for any successor schemes which would follow from a subsequent auction. One might reasonably ask: could the need for further infrastructure have been foreseen and, more importantly, planned at the outset?

The second auction signalled more gas: the initial connection to the terminals had satisfied the demands for Wales whereas this additional gas was destined for England. Peterstow and Tirley were selected as the aiming points with existing pipeline infrastructure. Four significant obstacles lay in the way of getting to these destinations: the Bristol Channel, the south Wales valleys, the Sennybridge military ranges and the Brecon Beacons National Park. Finding the most direct route under, through or around these perceived hurdles, to the satisfaction of all concerned, was the priority task.

Several corridors starting at Aberdulais were originally appraised. I remember very well the day we presented the results of this initial assessment to National Grid's directors, when we were told bluntly to start again, and this time find a corridor that completely avoids the National Park. Eventually 19 corridors were identified and assessed including those with sub-sea routes, some even originating

The pipe passing under the Nant Rheona

back at the terminals in Milford Haven. All sub-sea corridors were discounted due to seemingly insurmountable difficulties of shifting sands in the Severn Estuary. The absence of any definable gaps in the conurbations and industry of the south Wales valleys, and the obviously unpalatable mix of high pressure pipeline and military range, left us with two realistic corridors; either clipping the northern corner of the National Park or circumventing it by skirting around Builth Wells.

The final choice was relatively straightforward. The corridor away from the National Park would add distance and cost, with still significant environmental and engineering challenges. More importantly it could not be completed in the contractual time and would not meet with the regulatory licence requirements. Having identified a preferred corridor our next task was to find the most benign route through an internationally protected landscape. Convincing all the consultees that this was indeed possible became my primary role.

In direct consultation with an exhaustive list of consultees and the assistance of a small army of ecological, archaeological and geotechnical consultants, in-house engineers and land agents, the route investigations evolved into a defined line. Adopting the premise of avoiding, where possible, all features of ecological merit enabled the team to

maintain an essential working relationship. The preliminary route would stretch over 190kms with a 36km section through the National Park starting close to Myddfai village, just south of Llandovery, and progress east towards Brecon down the Usk valley, skirting the settlements of Trecastle and Sennybridge (see back cover for map).

## Mynydd Myddfai

Finding a route through the Park was never going to be easy, especially as the first thing you encounter on the northwestern boundary is the historic mountain side of Mynydd Myddfai. I am not sure whether it was the efforts of the team to route and re-route theoretical lines across the hill, avoiding neolithic cairns and the internationally rare slender green feather moss (*Hamatocaulis vernicosus*), or the fear in the beleaguered consultees of being dragged out on yet another bitterly cold site visit, but finally a local route was agreed.

Soon after the consent was granted by the Secretary of State in February 2007, work to construct the pipeline began at whirlwind pace. By this time I had already left the project to restore my sleep-deprived mind and body, only to return in a new role with the NPA less than six months later. The pace of construction soon slowed when the consultees managed to rein in the workforce and control their progress across the mountain, allowing the archaeological investigations and macro-turfing operations to be completed in accordance with the previously approved method statements. When the landscape was opened up with a large brown incision, the colossal scale of this project was plain for all to see.

Leaving Mynydd Myddfai the pipeline entered the upper catchment of the River Usk Special Area of Conservation (SAC). In early discussions with the Countryside Council for Wales (CCW), Environment Agency Wales (EAW) and the NPA it was agreed that the main rivers and their notable tributaries would be crossed by non-opencut method, either tunnelling or auguring below the watercourse. Although this increased engineering complexity and cost it was essential to satisfy the rigorous requirements of the Habitat Regulations. The other key requirement was the ability of the construction teams to protect the rivers from the potentially polluting impacts of silt run-off from the working area. This factor underpinned the consent for the pipeline and became enshrined in the conditions.

## Problems with silt

Persistent and at times torrential rainfall in the summer and early winter of 2007 exposed weaknesses in the understanding and resourcing of the efforts necessary to minimise the flow of silt run-off. This was ultimately addressed, though often after the event. More critically it raised retrospective questions over the ability to demonstrate due regard for the requirements of the Habitats Regulations, a prerequisite for granting permission for the pipeline project. Condition 30 stated "... run-off with entrained sediment must be dispersed to adjoining land, the locations and methods selected must ensure that sediment will not enter watercourses identified as Special Areas of Conservation." Enforcement of such avoidance was not working, with torrents of soil stained run-off entering the Usk and Wye SACs for several months. Many local people, myself included, remain quizzical over the eventual conclusion that, despite the pre-condition of avoidance, thousands of litres of silt-laden water could apparently enter watercourses without causing detriment.

Poor weather during the construction period had a knock-on effect, delaying reinstatement and ultimate restoration of the landscape. Concerns were expressed at the outset that the pipeline could not be built in a single season (March to October) and therefore large

Silt run-off entering the Usk reservoir, June 2007

Silt run-off south of Sennybridge, January 2008

swathes of exposed 'working widths' or freshly laid topsoil would be left to the mercy of the winter. In an attempt to manage this threat a specific condition was attached to the consent preventing National Grid from commencing if they could not theoretically guarantee to complete the construction of floodplains and associated vulnerable areas by the end of August. The weather-imposed delays posed a difficult choice - continue to reinstate or lock down the working width and prepare for winter. In the end an ineffective combination of decisions created a myriad of problems and even more mud-strewn roads extending the woes of the local community.

### Full restoration?

Reinstatement of the land within the Park was eventually completed by the middle of 2008, when most of the construction roadshow had decamped for pastures new. However, the job was far from complete, especially across Mynydd Myddfai and other smaller sites of ecological note. These 'affected locations' became the primary focus of the aftercare management teams to achieve what was described in the conditions as 'full restoration'. However, in the haste to get the consent issued, the term 'full restoration' had never been defined. This left all parties with the awkward task of identifying, post consent, an end point and sign-off process for the 'affected locations'. Unlike the enclosed agricultural land, which has in the main been restored to a high standard, allowing the pipeline route to fade back into the landscape, it was soon apparent that the 'affected locations' needed more time and thought. In some cases it has been necessary for CCW and I to accept that 'full restoration' may not be achieved. A significant lesson for future schemes, and one that I have endeavoured to share with colleagues in Snowdonia National Park, where smaller pipelines are being laid or planned.

The end may be in sight, and we can look back at the wealth of lessons and experience gained from this project. I am reminded by a colleague in the Dyfed Archaeological Trust that although the layers of landscape, and in particular that of Mynydd Myddfai, may have been physically and metaphorically stripped back to reveal their historic stories, there is now a new and somewhat alien layer within. Through the continued endeavours of National Grid the land may be healing and our understanding of the landscape increased, but it will never be the same. Those of us who know what now lies beneath our feet may feel that our experience and pleasure of the Park is a little diminished simply by this knowledge. For those thousands of visitors who enjoy the splendour of the hills and rivers, they can continue to do so in the knowledge that when the work ends, even I will struggle to find the route of the Felindre to Tirley gas pipeline.

*Since 2007* ***Graham Cowden*** *has been a Conservation Officer for the Brecon Beacons National Park Authority.*

## Ar ôl y bibell

Mae angen pibell anferthol, 1200mm o led, i gludo nwy o Aberdaugleddau i weddill y DU. Gyda'r cymoedd yn frith o dai a diwydiant ac anawsterau technegol ynghlwm wrth ddefnyddio aber afon Hafren, roedd rhaid i'r bibell fynd drwy 36km o Barc Cenedlaethol Bannau Brycheiniog. Disgrifiodd Graham Cowden ei rôl fel rheolwr amgylchedd sy'n cynllunio'r bibell ar ran y Grid Cenedlaethol, a'r pwysau o orfod penderfynu ar y llwybr lleiaf niweidiol mewn blwyddyn. Ar ôl cytuno ar y llwybr a'r cynllun gyda'i holl amodau, fel peidio â gadael i waddodion neu silt lifo i'r afonydd, newidiodd ochr. Yn 2007, ymunodd ag Awdurdod y Parc Cenedlaethol fel swyddog cadwraeth sy'n gyfrifol am oruchwylio'r gwaith adeiladu ac 'adfer llawn' - term yr hoffai fod wedi'i ddiffinio'n fanylach yn y contract!

Rohan Holt

# Limpets *in Pembrokeshire*

*Limpets, limpets everywhere but...How many? Are they changing? Is this normal? How do we know?* ***JOHN ARCHER-THOMSON*** *emphasises the importance of long running data sets to get a true measure of the impact of disasters such as the* Sea Empress.

Dale Fort is one of the Field Studies Council's (FSC) residential Field Centres and has been so for over 60 years. The FSC has three Welsh Centres, one in Snowdonia and two in Pembrokeshire: Dale Fort's speciality is marine and coastal ecology. I first joined the teaching staff in September 1982: at that time one regular student investigation looked at the population dynamics of common limpets on a moderately sheltered rocky shore called 'Frenchman's Steps'. We investigated the vertical range of the limpets (how high and low they could live on the shore); their size range and how this might vary with height; and also how their numbers (abundance) varied up and down the shore. Immersion time in sea water decreases significantly with increasing height up a shore, consequently shores exhibit a pronounced environmental gradient from top to bottom. Salty but essentially terrestrial conditions exist at the top of the shore: marine conditions prevail at the base. As a result rocky shores are fascinating places in which to conduct ecological investigations.

The method for data collection is simple. Groups of students are spaced at regular intervals along a tape measure, which runs parallel with the water's edge, at the known starting height near the base of the shore. Each group has a 50 x 50cm quadrat (sample area) in which they measure the longest diameter of all the limpets they can find, recording the measurements in 5mm size classes. Groups then move up the shore to the next height (75cm above) and repeat the process, continuing upwards at regular height intervals until they run out of limpets to measure. In official sampling terms this is an interrupted belt transect at 75cm vertical height intervals, with up to ten replicates at each height. Results are then standardised so that they are comparable despite originating from different numbers of groups / replicates.

The survey site at Frenchman's Steps

John Archer-Thomson

## Limpet size

Typically there are fewer limpets at the top of the shore because of factors such as dehydration and temperature stress: they are also lower at the bottom of the shore because, although conditions are much better for marine organisms, there are issues such as competition for space (with other species better suited to this part of the shore). Indeed, on this particular shore the substrate becomes less suitable as there are more pebbles and less solid rock for limpets to attach to. Optimum conditions, between these two extremes, are to be found in roughly the middle of the shore, so this is where limpet numbers peak.

Most limpets are to be found in the 10-14.99mm size class. To analyse this data we make an assumption that limpet size varies with age, the largest therefore being the oldest. This is a reasonable assumption for any individual shore but definitely not safe if comparing limpets on different shores. Growth rate in limpets is indeterminate, with no fixed maximum, and very sensitive to food supply. There are fewer big (old) limpets because they die (disease, predation etc.). There appear to be fewer small (young) limpets as they are much more difficult to see because of their diminutive size: young limpets tend to live in damp microhabitats such as crevices where they are difficult to spot. Small limpets grow more quickly and would move into larger size classes relatively quickly.

Limpets also seem to get bigger (on average) with increasing height up the shore. Explanations for this vary and indeed the strength of the trend varies considerably from shore to shore, although it has been a constant in the Frenchman's Steps data. Most small limpets are to be found on the lower part of the shore, which is immersed for longer periods, because this is where the limpet larvae settle when they leave their planktonic phase behind them and their thin shells mean they are prone to desiccation. One theory suggests that as limpets grow they need more space so they migrate upshore to where there is less competition for a place on the rocks. This is fine, although some workers disagree that this occurs, but it does seem to conflict with another known aspect of limpet behaviour, that of 'homing'. Limpets forage for green seaweeds, lichens and the biofilm of microscopic algae and cyanobacteria, scraping food off the rock surface with a tongue-like structure called a radula, and afterwards returning to their original place on the rocks. In experiments I have done with student groups, 'homing' is over 95% successful. This rather

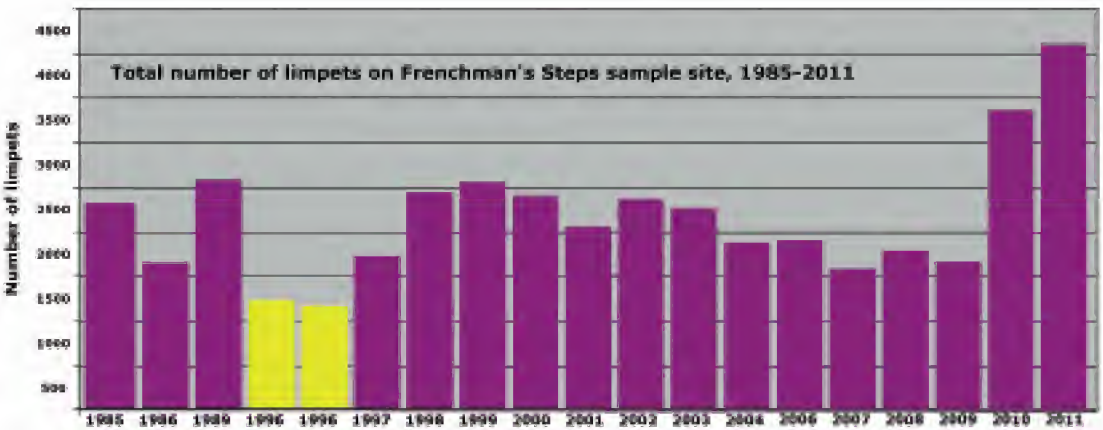
Sea Empress oil spill 1996

contradicts the idea of limpets migrating up the rocks into space. A suggestion which makes sense is that homing is the norm until the limpet outgrows (or gets ousted from) its home scar, then it migrates up the rocks into space where a new home scar is instigated.

## Sea Empress

Student groups vary in their motivation and competence and hence the quality of their results but I decided to keep the sets of data we had collected without being entirely sure why! Then, in 1996, the Sea Empress tanker threw 72,000 tons of Forties Blend, light crude oil over the coast of the Pembrokeshire Coast National Park and Frenchman's Steps got its fair share. Suddenly my (warts and all) student data looked very interesting as a record of what was there before the spill. Mortality rates were in the region of 50% for our shores around Dale Fort. Other shores fared rather worse – West Angle Bay suffered close to 95% mortality. The size data showed a shift in the modal class from the 'normal' 10-14.99mm size class to the 15-19.99mm one. Oil kills limpets and young ones are particularly susceptible, hence the shift in the modal class. Within a year, perhaps surprisingly given the extent of the spill, numbers had recovered to within what might be considered a normal range, but the size class data were still skewed to the right. Within two years the modal class had returned to the typical 10-14.99mm slot and the population was back (in gross terms) to what might be considered normal. The rate of apparent recovery was surprisingly rapid.

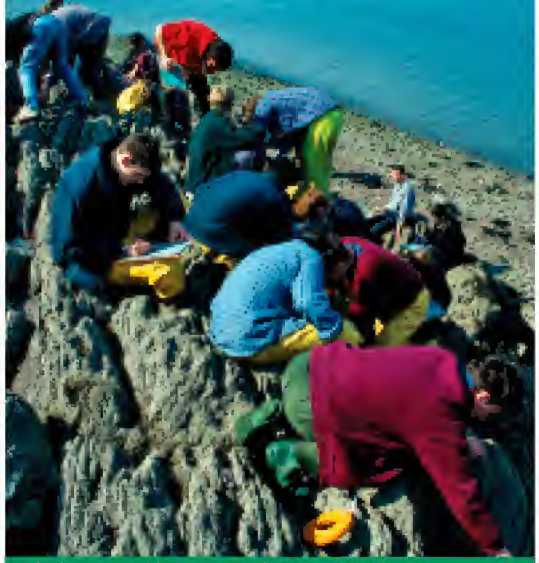
I wasn't entirely happy with the quality of the pre-pollution data though, and I wished to know what represented a 'natural' variation in the population of limpets on Frenchman's Steps. From 1996 onwards, every April, a group of post-graduate students from the University of Leuven, Belgium, and latterly the teaching staff at Dale Fort, has monitored the



population and the graph on the previous page shows the results to date. There are two 1996 data sets (in yellow) as I wished to demonstrate that although this is student data, these two data sets taken within a fortnight of each other, by two different school groups, were remarkably and reassuringly close to each other. Since then the size class data has resolutely stayed in the 10-14.99mm size class so this seems to be 'normal'. The number of limpets has varied, albeit within what seemed reasonable limits, until 2010 when results exceeded all previous years by so much that I thought my conscientious teaching staff had done it too well! When we all collected data in April 2011 the results showed record breaking numbers of limpets on the shore, confirming that the 2010 data was not a blip. 2011 was a very good year for limpets!

What happens next? It is tempting to speculate that the numbers present on the shore in 2011 are unsustainably high so monitoring will continue to see what happens – roll on next April!

Although counting and measuring limpets in little blue squares may not be considered cutting edge science I think the exercise has tremendous value. Long term data sets showing variation (or lack of it) in 'natural' populations are not that common. It is unwise to speculate on the effects of pollution, climate change etc. if the information about natural fluctuations in populations is not available. I think students benefit educationally from seeing how data they have collected fits into a bigger picture and has relevance to the real world in which, unfortunately, oil spills occur.



John Archer-Thomson

An interrupted belt transect in progress

**Taxonomic note:** I have been deliberately vague about the limpet species here. The Frenchman's Steps' population is almost exclusively the common limpet *Patella vulgata*, but it's possible that china limpet *P. ulyssiponensis* and blackfooted limpet *P. intermedia* are present on the lower shore and in pools. It is difficult to tell the species apart without removing them from the rock, stressing and possibly killing them - not acceptable for student groups working on a regular basis, and best avoided unless scientifically essential.

***John Archer-Thomson** is Assistant Head of Centre at the Field Studies Council's Dale Fort Field Centre. John is also a member of NATUR.*

## Gwerth data hirdymor Dale

Bu'r ganolfan astudio maes yn Dale yn casglu data am ecoleg morol ac arfordirol, yn cynnwys maint a dosbarthiad llygaid maharen (neu brenig), ers ei sefydlu dros 60 mlynedd yn ôl. Er mor amrywiol oedd ansawdd setiau data'r myfyrywyr o flwyddyn i flwyddyn, roeddent yn creu darlun clir o natur y glannau cyn trychineb olew y Sea Empress. Er i'r olew effeithio'n sylweddol ar y llygaid maharen bychain ar y cychwyn roedd y glannau wedi adfer yn syndod o gyflym o fewn dwy flynedd.

Er mwyn codi safon a chysondeb y data sy'n cynrychioli sefyllfa 'cyn olew' rydym wedi bod yn monitro llygaid maharen yn flynyddol ers 1996 er mwyn deall yn well yr amrywiad 'naturiol' yn y boblogaeth sydd yn Frenchman's Bay. Dysgwyd mai maint 10-14.99mm sy'n normal a bod niferoedd yn amrywio'n flynyddol ond o fewn ffiniau rhesymol – ag eithrio niferoedd rhyfeddol 2010 a 2011. Mae gwaith caib a rhaw fel hyn yn dangos gwerth data tymor hir – amhosib yw damcaniaethu am effeithiau ffactorau fel llygredd a newid hinsawdd oni bai bod gennym ddealltwriaeth o amrywiadau naturiol ym mhoblogathau rhywogaethau gwyllt

BBNPA

# Fires
## *and hi-tech surveys*

***Heavy snow and arctic temperatures in early 2011 gave way to the driest spring for 30 years with frost-killed vegetation adding to the fire load. Most scientific organisations expect such weather conditions to occur more frequently.* ***JUDITH HARVEY*** *urges nature conservation organisations to consider fire load management as a priority: if allowed to build up, catastrophic impacts will result.* ***SHAUN LEWIS*** *explains how remote sensing technology is being used to map out a comprehensive baseline from which to monitor restoration progress.***

Why not just let it burn?

Fires started in the Brecon Beacons in mid April, spreading across several fire authority areas, and our wardens were involved in fire fighting alongside fire crews for many days. Affected areas included: Manor Mawr, a *Molinia* dominated moorland; Cefn Garreg, an area of enclosed hill with extensive stands of mature heather; and Mynydd Isaf, the most westerly area of common land in the Park. Both Manor Mawr and Mynydd Isaf are commons owned by the National Park and have been subject to regular swaling (controlled burning) by wardens. They have also been frequent victims of arson by persons unknown.

Probably the question I was asked most often during and after the fire was ...'why not just let it burn? Fire after all is a natural occurrence'. My reply was that extensive areas of the burn were SSSI. Manor Mawr apart, the habitat was valuable in its own right with areas of wet heath, dry heath and blanket bog. It was particularly important to work with the fire services to limit the damage to the heather and bilberry moorland. The ecosystem of Mynydd Isaf was diverse with brown hare,

about 30 pairs of red grouse, merlin, and sky lark populations. During the burn, hen harriers could be seen flying along the fire front seeking out prey running from flames.

Within the burn area most of the soil was peat-based or peat soil, normally a soggy upland sponge holding the water back in the hills. At the time of the fire it was drier than I had ever seen before, making it possible to drive across some of the wettest heaths on a quad. Once alight, the dry peat burned deep underground, beyond the reach of our beaters and limited water supplies.

For over a week the flames were fanned with a strong wind initially from the east and then from the southwest, which eventually blew in some rain and cooler temperatures allowing the surface fires to be extinguished. Meanwhile, the underground combustion continued for a further week until doused by a downpour and thorough soaking.

## Hyperspectral imagery

It was time to review the impacts wrought by the fire. However, the burnt area was so great that we looked to airborne surveys and new technologies to map, assess and provide a baseline from which to view future change over a 15-year period. Aerial photography is already used extensively by local authorities to track changes on the ground, such as a decline in a type of vegetation or an extension built on a house. What we wanted to do was go one step further and use hyperspectral imagery.

Working with hyperspectral sensors, this technology enables us to 'see' ten times more than the human eye or aerial photography can see, in terms of electromagnetic spectrum. Using aerial photography, millstone grit and limestone would appear as 'rock', whereas with hyperspectral imagery we can specify the types of rock.

Computer algorithms have been developed to distinguish between the spectral signature of one surface – for example healthy bracken – from another, such as clear water. Consequently, we only need to map

Trevor Williams

Skylark: at risk

part of a surface by human eye, and the computer will classify the same surface in other parts of the imagery. To improve the accuracy further, we can add rules such as 'surface A is usually found on a north facing slope'; thus the topography becomes very important when distinguishing between surfaces.

Another possibility with airborne survey is the use of LiDAR (Light Detection And Ranging). This involves the use of a laser to measure the distance between the ground and the aircraft, and therefore the topography. Not only will the LiDAR provide us with fine quality height data, but slope, aspect, and hillshade can be derived to assist the land cover classifications.

The National Park Authority (NPA) commissioned the Airborne Research and Survey Facility at NERC to capture hyperspectral imagery and LiDAR in order to establish a baseline to monitor the consequences of these fires on surface vegetation and the underlying peat of Mynydd Isaf.

The task now is to analyse the data to provide the

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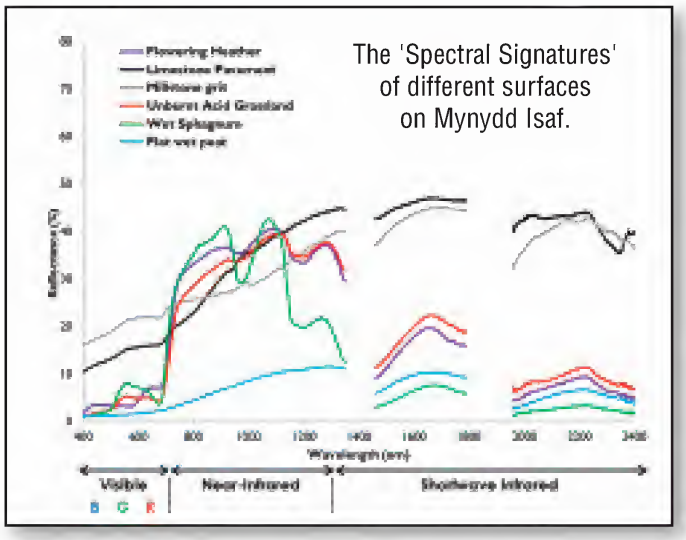
Not swaling but beating wild fire: large areas of dwarf shrub heath burned for over a week at Mynydd Isaf.

NPA with its much needed baseline in order that it can identify where adverse impacts are likely to occur following the wildfires. We can repeat the data capture, with ease and precision, to monitor positive and negative trends: to show where things have got better or worse and those areas where more management are needed.




## Atmospheric interference

One difficulty to overcome is that hyperspectral data is subject to absorption and scattering by the atmosphere; which makes it difficult to compare images acquired on different dates. As advised by the Remote Sensing faculty at Aberystwyth University; it is important to convert the data from radiance (measured at the sensor) to reflectance (an inherent property of a material) by using field spectroscopy techniques. White, grey and black calibration targets were placed on the ground aligned with the proposed flight line. A spectroradiometer was used to record the reflectance characteristics of the targets and common land surfaces at the time of the flight. The results recorded in the field show the reflectance (%) of a surface at different wavelengths of the electromagnetic spectrum.

Not only will the results be used to atmospherically correct the hyperspectral

images but also to help us distinguish and classify the land cover. As shown by the image on the previous page, we can use these charts to determine rules between different surfaces. For example millstone grit has a higher (%) reflectance in the green part of the electromagnetic spectrum (550nm) than limestone pavement.

LiDAR will be repeated in our next survey so that we can indicate any peat hag shrinkage. We also aim to use LiDAR to calculate the drainage patterns so that we can assess the erosion risk of the burnt areas and determine the best options for managing the land.

Beyond Mynydd Isaf LiDAR technology is being used in other nearby areas, such as Waun Fignen Felen (see pp 22-26). This is a valley mire that has a large exposed area of peat and is currently a major focus of a restoration project, which we have dubbed 'Black to Green'. In a similar way LiDAR is being used at Hatteral Ridge to examine the hydrology. The technology has been used in the past to map historic boundaries, banks, ditches and outcrops and the Dyfed Archaeological Trust are going to use it at Herbert's Quarry.

## Conclusion

With the application of emerging aerial or remote sensing technology we are able to survey large tracts of difficult terrain in a highly efficient and cost-effective manner. Hopefully this will assist the speedy recovery of the Brecon Beacons to its pre-fire glory.

***Judith Harvey**, Western Area Manager and **Shaun Lewis**, GIS Analyst, both work for the Brecon Beacons National Park Authority.*

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## Tanau ac arolygon uwch-dechnoleg

Ar ôl eira mawr a thymheredd iasoer ddechrau 2011, cafwyd y gwanwyn sychaf ers 30 mlynedd gyda llystyfiant a laddwyd gan rew yn ychwanegu at yr hyn allai losgi. Bu dynion tân a wardeiniaid yn brwydro yn erbyn y fflamau mewn sawl ardal gan gynnwys Mynydd Isaf â'i boblogaeth o ysgyfarnogod, tua 30 pâr o rugieir coch, cudyllod bach a'r ehedydd. Gwelwyd bodaod tinwyn yn hedfan uwchben y tân yn chwilio am ysglyfaeth ar ffo o'r fflamau. Mae arolygon cynhwysfawr yn cael eu paratoi gan ddefnyddio technoleg olrhain o bell ar awyren, sy'n gallu 'gweld' ddeg gwaith yn well na'r llygad dynol, a laserau sy'n disgrifio'n dirwedd. Mae hyn yn creu gwybodaeth sylfaenol y gellir ei hailadrodd yn hawdd a thrylwyr, er mwyn monitro a rheoli'r broses o adfer y tir.

Lluniau: Arwel Michael

# Waun Fignen Felen

*Mae rheolaeth Waun Fignen Felen, sy'n gorwedd uwchben ogofeydd Dan yr Ogof, ym mhen uchaf Cwm Tawe, wedi peri tipyn o gur pen a gofid dros y blynyddoedd.* ***ARWEL MICHAEL*** *sy'n olrhain hanes y safle o gyfnodau cynhanesol hyd at heddiw ac yn adrodd ar y gwaith diweddar sy'n golygu bod ei ddyfodol yn edrych yn llawer mwy llewyrchus erbyn hyn.*

Ers mis Medi 2004 mae Parc Cenedlaethol Bannau Brycheiniog wedi bod wrthi'n ddyfal yn ceisio gwarchod Waun Fignen Felen, sy'n Safle o Ddiddordeb Gwyddonol Arbennig, rhag dirywio ymhellach.

Mae'r Waun yn gorwedd mewn pantle mawnog ar lwyfandir o garreg galch ym mhen uchaf Cwm Tawe ar y Mynydd Du, 480m uwchben y môr (SN825179). Llyn dŵr, yn mesur rhyw 1k ar ei draws, oedd yno ar ddiwedd yr Oes yr Iâ ddiwethaf.

Oddeutu 12,000 CC roedd y rhewlifoedd yn dechrau toddi'n raddol ar Fannau Brycheiniog ac wrth i'r hinsawdd wella gwelwyd olyniaeth o blanhigion yn datblygu ar draws y dirwedd.

Erbyn 7,000CC roedd yr ardal yn mwynhau hinsawdd Ogleddol ('Boreal'). Roedd yn gyfnod cymharol sych a chynnes. Roedd y rhan fwyaf o dir uchel Prydain, hyd at 600m, o dan dyfiant o goed bedw a phinwydd. Gwelwyd tyfiant o goed deri a chyll ar y tir isaf, ac o amgylch y tir corsiog a'r afonydd  y coed gwern oedd amlycaf.

Oddeutu 6,000CC fe wahanwyd Prydain oddi wrth weddill Ewrop oherwydd codiad yn lefel dŵr y môr.

Parhau i newid wnaeth yr hinsawdd ac erbyn 5,000CC fe ddaeth hinsawdd lwerydd ('Atlantic') gyda thywydd llaith, cefnforol ac eithaf cynnes. Mae'n debygol bod y tymheredd rhyw 3°C yn uwch nag ydyw heddiw. Roedd coedwigoedd yn doreithiog, gyda phlanhigion bwytadwy - aeron, cnau, blagur, ffwng a grawn - a digon o anifeiliaid gwyllt megis baedd, ych, ceirw a belaod coed. Roedd hefyd digonedd o bysgod yn yr afonydd a'r llynnoedd. Yn ystod Oes Ganol y Cerrig roedd y bobl yn gallu elwa ar yr adnoddau naturiol. Roeddynt yn gelfydd iawn fel helwyr a chasglwyr, gan fforio a chwilio am fwyd a defnyddiau crai ar gyfer eu hanghenion bob dydd.

Dyna'r math o fywyd oedd yn y bryniau o amgylch Waun Fignen Felen ym mhen uchaf Cwm Tawe bryd hynny. Ac yn Oes Ganol y Cerrig, llyn beistion oedd ar y safle hwn - dŵr agored wedi ei amgylchynu gan siglen a phrysgwydd. Mae dŵr y llyn wedi diflannu drwy'r garreg calch i lawr i ogofau Dan-yr-Ogof ers amser maith ac erbyn heddiw mignen sydd yno. Mae'r mawn wedi erydu ers blynyddoedd, ac mae saith modfedd wedi diflannu oddi ar wyneb y fawnog ers pedair blynedd mewn ambell fan, gan effeithio ar ansawdd y dŵr sy'n llifo mewn i'r ogofâu. Ar ddiwedd pob gaeaf mae darnau sylweddol o wraidd coed yn cael eu golchi allan o'r mawn, ond maent yn pydru'n fuan yn yr awyr agored.

Yn 1979 daeth archeolegwyr ar draws darnau o fflint a gwastraff fflint mewn safleoedd o amgylch y waun ac ystyrir eu bod yn dyddio o Oes Ganol y Cerrig. Yn 1980-82 archwiliwyd dau safle arbennig. Yn y cyntaf darganfuwyd 12 o ddarnau bach o ficrolithau. Yn yr ail daethpwyd o hyd i 51 o fflintiau ar wasgar, yn cynnwys 3 microlith, ysgrafell ac un llafn wedi ei ricio. Yn ychwanegol, darganfuwyd darnau a ffurfiwyd gan ddyn nôl yn yr Oes Efydd, yn ôl pob tebyg, sef 10 microlith, carreg hirgron wedi ei sgrafellu, 55 darn o fflint a blaen bachog saeth.

Mae'n amlwg bod dynoliaeth wedi cael effaith barhaol ar ecoleg y safle, ac fel yr eglurwyd uchod, mawnen yn gorwedd mewn pantle sydd yno bellach. Mae'n debygol bod dyn wedi bod yn bresennol ar y safle hwn mor bell yn ôl â'r degfed mileniwm CP. Fe grewyd darn agored o dir o amgylch y llyn cyn 8,000CP a'i gadw ar agor gan weithgarwch dynol. Wedi'r cyfnod hwn gwelwyd cyfres o newidiadau yn natur y llystyfiant o ganlyniad i ymyrraeth ddynol – megis llosgi coed.

Mae'n bosibl bod yr arfer o bori anifeiliaid wedi digwydd yno hefyd. Mae'n debyg i'r rhostir gael ei ffurfio mor bell yn ôl â 7,000CP ac mae dylanwad dyn ar y tirlun wedi bod yn amlwg ers y cyfnod hwnnw. Ehangodd y llyn ac chafwyd cynnydd yn nifer yr anifeiliaid pori ar y glannau. Yn raddol fe ddisodlwyd y rhostir gan blanhigion a oedd yn fwy goddefgar o'r dŵr ac a drodd y llyn yn wrthban o fawn yn y pen draw. Dichon hefyd bod yr ardal yn cael ei llosgi'n gyson.

Dangosodd archwiliad ar baill y cyfnod bod newid mawr wedi digwydd yn ystod Oes yr Efydd. Prinhaodd y coed. Gwelwyd ymddangosiad llawer o redyn a phlanhigion trofannol a hynny'n cyddigwydd â dirywiad yn y llwyfen. Dichon bod cyflwr Waun Fignen Felen yn ein dyddiau ni yn cael ei effeithio gan lygredd diwydiannol, agosatrwydd at Fôr Iwerydd a dylanwad pori defaid. Pwy a wyr?

Mae archwiliadau Shaun Lewis o Brifysgol Aberystwyth yn dangos fod 3,000 o dunelli o carbon i bob hectar wedi diflannu i'r awyrgylch o Waun Fignen Felen rhwng 1945 a 2010. Mae Waun Fignen Felen yn 20 hectar o faint sy'n golygu bod tua 60,000 o dunelli o carbon wedi eu gollwng i'r awyrgylch mewn chwe deg pum mlynedd.

Erbyn dechrau 2000 gwelwyd fod cyflwr Waun Fignen Felen yn gwaethygu'n ofnadwy ac roedd angen mynd i'r afael â'r sefyllfa ar frys. Roedd pobl wedi bod yn pryderu'n fawr am ddyfodol y safle ers y nawdegau. Gwelwyd fod dŵr ar y safle, yn enwedig ar ôl glaw trwm, yn torri ffosydd dwfn yn y mawn gan gludo'r mawn i mewn i system danddaearol Dan-yr-Ogof, sy'n Safle o Ddiddordeb Gwyddonol Arbennig. Roedd erydiad y Waun yn achosi trafferthion yn y system ogof a chyn dechrau pob tymor ymwelwyr yn y gwanwyn, roedd rhaid cludo mawn allan o Dan-yr-Ogof. Golygai hynny wneud dros ddeg ar hugain o siwrneau gyda cherbyd dympio â'i lond o fawn.

Y gweundir yn 2005, cyn i'r gwaith adfer ddechrau
The degraded moorland in 2005, before work began

Gwelwyd bod surni'r dŵr yn cynyddu y tu mewn i'r ogof ac roedd hyn yn cael effaith ar ecoleg yr ogof.

Yn ystod mis Medi 2004 codwyd ffens dros dro gan y Parc Cenedlaethol o amgylch Waun Fignen Felen i warchod y safle.

Yna, ym mis Mai 2005 a Thachwedd 2006, cludwyd nifer helaeth o sachau gwellt a thoriadau eithin i'r Waun gan awyren hofran. Gosodwyd nifer ohonynt yn y ffosydd, fel rhyw fath o argaeau, er mwyn arafu cyflymdra llif y dŵr a dal y mawn yn sefydlog y tu ôl

iddynt. Defnyddiwyd gwellt ag eithin oedd wedi torri'n lleol rhag ofn cyflwyno planhigion dieithr i'r Waun.

Mae'r gwaith caled wedi dwyn ffrwyth oherwydd gwelir llawer llai o erydiad ar y Waun erbyn hyn. Does braidd dim mawn yn cael ei gludo bellach i mewn i ogofeydd Dan-yr-Ogof. Newidiodd y Waun yn raddol yn ystod y flwyddyn gyntaf. Cafodd planhigion gyfle o'r newydd i dyfu yno ac erbyn heddiw gwelir gwell amrywiaeth o blanhigion yn y llystyfiant – yn cynnwys ambell goeden fedwen sy'n dangos ei phen. Bellach mae'r waun yn dechrau ymdoddi unwaith eto i'r tirlun mynyddig o'i chwmpas.

Yn ystod mis Gorffennaf 2009 ffurfiwyd Fforwm Rheolaeth i gynnig cyngor ynglŷn â gwarchod Waun Fignen Felen ar gyfer y dyfodol, dan Gadeiryddiaeth Parc Cenedlaethol Bannau Brycheiniog, a Dŵr Cymru, sy'n berchen ar Waun Fignen Felen a rhan helaeth o'r mynydd o'i amgylch. Fe wahoddwyd nifer o gymdeithasau eraill gyda phrofiad o warchod yr amgylchedd i ymuno â'r fforwm.

Mae rhagor i'w wneud eto i ddiogelu'r Waun, a

Gwneud defnydd o wellt
Bringing in the straw

Cyflwr y gweundir yn dechrau gwella wrth i'r gwellt sefydlogi'r tir.
The moor begins to recover after straw mulches stabilise the ground.

PRIFYSGOL
BANGOR

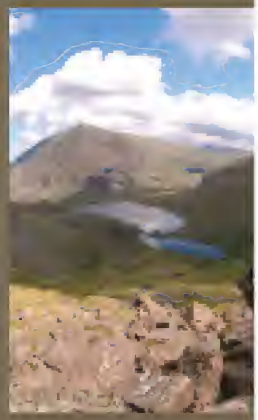
# MSc / MA
# Rheolaeth Amgylcheddol Gynaliadwy

**Diddordeb yn ein dyfodol?**
**Chwilio am waith ym myd cadwraeth a'r amgylchedd?**
**Profiad eang o waith perthnasol?**
**Angen hwb i'ch gyrfa?**
**Am astudio drwy gyfrwng y Gymraeg?**

Mae'r cwrs meistr cyfrwng Cymraeg unigryw hwn wedi ei anelu at fyfyrwyr sydd â diddordeb gwirioneddol mewn datblygu cynaliadwy a materion amgylcheddol.

Byddwn yn croesawu ceisiadau gan raddedigion o bob maes. Rydym hefyd yn awyddus i dderbyn ceisiadau gan bobl sydd heb radd ond sydd â phrofiad a chefndir perthnasol.

Mae galw cynyddol gan gyflogwyr yng Nghymru am bobl sydd nid yn unig gyda'r cymwysterau amgylcheddol perthnasol, ond sydd hefyd yn gallu trin a thrafod y maes allweddol hwn trwy gyfrwng y Gymraeg



- **Gwaith Maes**
- **Lleoliadau Gwaith Proffesiynol**
- **Astudiwch yn llawn amser dros flwyddyn neu'n rhan amser dros ddwy flynedd**
- **Cymorth Ariannol ar gael drwy gynllun noddi'r Coleg Cymraeg Cenedlaethol**
- **Cymwys ar gyfer Ysgoloriaethau Aur ac Arian**

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hynny'n rhannol oherwydd natur y ddaeareg, sef carreg galch a maen melin, sydd o dan ac o amgylch y safle. Ond diolch i ymdrechion diweddar mae dyfodol y safle yn edrych yn llawer mwy llewyrchus erbyn hyn.

*Bu **Arwel Michael** yn gweithio am bedair blynedd ar ddeg yn y diwydiant oriorau yn Ystradgynlais, ac yna treuliodd 33 o flynyddoedd yn gweithio fel peiriannwr gyda chwmni Ford yn Abertawe. Mae'n aelod o Gymdeithas Edward Llwyd ers blynyddoedd lawer ac mae wedi gwasanaethu ar y Pwyllgor Gwaith. Mae wedi bod yn troedio mynyddoedd Cymru o ddifrif ers 53 o flynyddoedd bellach.*

## Caves, dams and delight...

The recovery of degraded moorland at Waun Fignen Felen, in the upper reaches of Cwm Tawe, is a success story for the dedicated team of individuals and organisations that has worked hard since the 1990s to stop peat from being flushed off this important site and into the Dan yr Ogof caves, where it was affecting the ecology of the underground ecosystem. The vegetation of Waun Fignen Felen, a Site of Special Scientific Interest, has benefitted from the damming of erosion channels with bales of locally sourced gorse and straw, which were flown in. They were strategically placed to slow water runoff, and to stabilise the peat body which has developed over millenia from the area of open water that existed on the site back in prehistoric times. The moorland vegetation is showing signs of recovery and is already becoming more diverse. The nature of the underlying rock – a mix of limestone and millstone grit – will always pose a challenge to the management of this site, but its future is looking far more favourable than it has done in recent decades.

Jessica Tyler NT

# Y Gyrn

## *Farming in the Brecon Beacons*

***JOE DAGGETT** explains the work that has gone into improving the landscape of Y Gyrn, including the replacement of Belgy Blues by Blue Greys crossed with a Blonde!*

If you asked a regular walker to the Brecon Beacons if they knew Y Gyrn, I guess they would stare at you blankly. Each year 100,000 walkers tread the Storey Arms path up to Corn Du and Pen y Fan, most of them unaware they are crossing its southern end on the first leg of their journey. Many assume it is just another part of the central beacons common but it is part of Blaenglyn Farm.

### A little bit of history

The National Trust acquired Blaenglyn Farm and the 265 hectares (600 acres) of Y Gyrn in 1969. It was probably typical for many upland farms: rough hill grass used for summer and winter grazing, protecting the lower fields for lambing and later on for hay or silage crops. It is now divided into two parts, the big and little Gyrn.

Various archaeological surveys have identified a number of small farmsteads and hut platforms, typically located on more level ground. These are likely to date to the early medieval period, the climate being

slightly warmer then than now, but may also be due to pressure on land from the changes in tenure following the Norman conquest. To the west and on the hill slopes are the remains of Iron Age settlements and below, in the Upper Tarell Valley, is a Bronze Age cairn. We are following in the footsteps of many who have gone before.

### What makes Y Gyrn special?

The surrounding common land is much more of a uniform green, grazed shorter for a longer period, allowing fewer plants to thrive and flower. In contrast Y Gyrn has a rich mix of texture, colour and diversity; dry and wet heath, blanket bog, acid grassland, scrub, marshy grassland, scree, bare rock, wet flushes, wooded streams, ravines and, inevitably, bracken! By early summer the hill plateau is a drift of white with cotton grass flowers, then later a hue of purple heather, reverting to a patchwork of browns and greys in winter.

In the early 1990s Y Gyrn supported the last remaining major stand of heather within the central beacons.

### Tenants' perspective

David and Doreen Prosser have been farming the land since 1984 and are now assisted by their youngest daughter Heather. Y Gyrn used to be grazed all year round and the little Gyrn stocked with over 2000 ewes for short periods, at shearing and dipping time. In 1989 they were approached by the Nature Conservancy Council to enter into a conservation agreement. This led to an initial three year scheme for a new fence between the Beacons

Joe Daggett NT

Blue grey cow with Charolais cross calf

Common and Y Gyrn, the removal of the fence between the big and little Gyrn and subsequent annual payments to off-winter the sheep. This scheme has largely continued to this day, with funding coming from Tir Gofal since 2010.

Belgy Blue cows were stocked for many years but they did not thrive. In 2001 foot and mouth put an end to cows being turned out until 2009, when the Prossers invested in a small herd of Blue Greys. The name and the colouring come from crossing a shorthorn, particularly the white strain, with a Galloway. This brings the rough mix of grazing to 11 cows, 20 ponies and 500 Brecknock Hill Cheviot ewes.

Talking to David and Heather recently, the introduction of the Blue Grey is seen as a "cheap option". David explained, "The cattle are not robbing the farm. The cows are on the hill in summer, and overwinter and calve in the shed. That means they are not grazing and poaching the fields during the winter months." The cows calve between autumn and January with the calves weaned off their mothers by the spring. Heather also explained that when the cows return to the hill for summer there are no problems with cows, calves and bulls clashing with walkers and dogs.

The calves are sold in June for fattening. The Blue Greys have been crossed with a Blonde/Aquitaine bull and they'll be trying a Charolais in the future. This means they can produce calves of reasonable stock. Replacement heifers are being bought from a

Jessica Tyler NT

Y Gyrn rising above Blaenglyn Farm

specialist market, in the Scottish Borders, as opposed to using their crossed calves.

When I asked David about the sheep flock that is turned out to Y Gyrn, his honest opinion is that they weren't doing as well now as in the past, as the grass was ranker with less fresh growth. We discussed whether the cutting of *Molinia* had helped but, whilst the cows had been drawn to those areas and grazed them regularly, it was difficult to tell whether there had been any benefit.

## Success stories and monitoring

Well, the heathland has regrown (got taller!) in the heavily grazed areas and we have maintained heathland communities over the whole site. The blanket bog is recovering and most areas of bare peat have been re-colonised by cotton grass.

Peregrine and merlin hunt over Y Gyrn and we have a small population of at least eight pairs of grouse. There are meadow pipits and skylarks on the plateau area, whilst the dry and grass heath and bracken areas support stonechat, reed bunting, meadow pipit, willow and (recorded in 2007) Dartford warbler. The tree and scrub areas support redstart and tree pipit.

We have funded the cutting and removal of *Molinia* in a patchwork across the marshy grassland and on the edge of the blanket bog. This was in order to help the stock better graze these *Molinia*-dominated areas and to see how we could regenerate older heather. The cut *Molinia* has also been used to mulch bare

Jill Pakenham

Wheatear

Michael D Smith

Merlin

Joe Daggett NT

## Y Gyrn, Bannau Brycheiniog

Mae'r Gyrn yn rhan o Iwybr Ilai cyfarwydd at gopa Pen-y-fan, ac yn eiddo i'r Ymddiriedolaeth Genedlaethol. Mae'r teulu Prosser wedi ffermio'r tir fel tenantiaid ers 1984, ac ym 1989 llofnodwyd cytundeb cadwraeth gyda'r nod o adfer y bryn i'w hen ogoniant gyda chymysgedd o rostir, corstir, glaswelltir, prysg, sgri a nentydd coediog. Mae patrymau pori wedi newid, gyda llai o ddefaid a mwy o wartheg. Mae'r gwartheg yn gaeafu a lloia yn y sied, ac yn osgoi difrodi'r bryn trwy bori yno yn yr haf yn unig. Torrwyd glaswellt y gweunydd (*Molinia*) a'i ddefnyddio fel gorchudd ar y rhannau mawnog moel er mwyn annog grug, mwsogl a glaswellt i aildyfu.

Mae'r rhostir wedi aildyfu yn y mannau sy'n cael ei bori'n ddwys, mae'r orgors yn adennill tir a phlu'r gweunydd wedi ail-gytrefu'r mannau mawnog moel. Mae'r rhostir yn gynefin i bob math o adar, gan gynnwys yr hebog tramor, y rugiar a'r tingoch. O ran y dyfodol agos, mae'r arferion pori cymysg yn saff ar y Gyrn ac mae'r cydbwysedd da o dda byw yn talu ar ei ganfed.

Joe Daggett NT

Regeneration on *Molinia* mulch

peat areas on the blanket bog, thereby encouraging heather and moss and grass regeneration.

I first became involved with this site as a new warden back in the mid 1990s, taking responsibility for monitoring various transects and quadrats. I religiously repeated this monitoring for three or four years. Then I sat down with our nature conservation advisor who, after some careful studying of the data, bluntly stated that the errors between surveys were so great that the data was useless! It was a hard lesson to learn. Subsequently little survey work was carried out until 2007, when we started to use the common standard monitoring approach. With a committed and enthusiastic full-time volunteer we completed three plots; one on dry heath, one on wet heath and the last on blanket bog. So we now have a better baseline to work from, supplemented with aerial photography, to measure change in the future.

### Looking ahead

In the late 1990s and early 2000s we survived heather beetle attacks which affected around 20% of the older heather. Further work will be needed if we want to expand the area of heather on Y Gyrn. Foot and mouth in 2001 saw heavy trafficking across the site and, even with low ground pressure vehicles, it took many years for the land to recover. Footpath erosion is still a problem on the public right of way and needs ongoing attention.

For the foreseeable future the mixed grazing on Y Gyrn is secure with a good balance of livestock which is paying its way. Come and enjoy!

***Joe Daggett** is Head Warden with the National Trust, Mid & South East Wales region.*

Mike Alexander

# Wales Coast Path

St Bride's Bay, Pembrokeshire

*In the past tracks appeared whenever enough tramping feet wore away the vegetation, but organizing new paths – literally 'fast-tracking' them – requires a bit more forethought and effort.* ***SUE RICE*** *examines the complexities of creating a long-distance path around Wales's coast, while* ***DENIS McATEER*** *looks at the exciting new opportunities the path could bring.*

## All round success

On 5th May 2012 the official opening of the Wales Coast Path (WCP) will make us unique as the only country in the world with a continuous coastal path, stretching 870 miles from the outskirts of Chester to Chepstow: Caer to Cas-gwent. Coastal Wales has been ranked as the top region in the world in Lonely Planet's Best in Travel 2012.

The project to develop the path started in 2007 with approximately £2 million per year from the Welsh Government and the coastal local authorities, plus £4 million allocated by the European Regional Development Fund over four years. New pathways have been negotiated with land owners, bridges installed, stiles and gates replaced, and boardwalks built to create the continuous path. Long distance paths of this nature can take decades to create but this ambitious project has been completed within five years through the enthusiastic cooperation of its partners.

Walking the path is a wonderful way of experiencing the spectacular and

varied scenery of the Welsh coast. It winds its way through towns and villages, across cliff tops and sandy beaches, sometimes darting inland before emerging once again at a sheltered cove or tiny hamlet that you would forever miss when travelling by car, bus or train.

Improving access for people with mobility problems has been at the heart of the work, ensuring that wherever practicable the path will be easy to use by people in wheelchairs and families with buggies. The path is for everyone, from those looking for a short stroll to those undertaking the whole route in one trip.

### More than just a walk

But it's not all about walking. The sheer breadth of activities and sights along the way is monumental. It passes a Geopark, a Marine Nature Reserve, two National Parks, three Areas of Outstanding Natural Beauty, 11 National Nature Reserves and 14 Heritage Coasts. And that's not to mention all the other things you can see or visit along the way, such as spotting bottlenose dolphins at New Quay, the stunning geology of Anglesey, Conwy Castle, the Dylan Thomas Centre, or even Whitmore Bay in Barry to get the real Gavin and Stacey experience!

A lot of care has gone into assessing the impact of the path upon wildlife. Birds have been of particular concern and work has been undertaken in places to ensure adequate screening, or that the path is sensitively routed to avoid unacceptable disturbance. Trying to accommodate coastal erosion and potential sea level rises has also affected how work has been implemented.

**Sue Rice, Access Programmes Manager for Countryside Council for Wales**

## A Ramblers Perspective

As the Chairman of Y Cerddwyr / Ramblers Cymru I am really excited about our involvement in the opening of the Wales Coast Path. This is hugely significant to us as part of The Ramblers Association, which is a national charity and so much more than just a walking club. We have a number of charitable objectives including facilitating access to

Quentin Grimley

Approaching Clarach near Aberystwyth

the countryside, protection of the beauty of the countryside, the provision and protection of footpaths and the encouragement of rambling and mountaineering in the interests of social welfare, including health. I hope that this new path will bring years of joy to locals and visitors who, by using it, can both improve their fitness levels and enjoy the beauty of our coast.

Once the new coastal footpath is established it can be linked with the existing Offa's Dyke path (which celebrated its 40th birthday in 2011) making Wales unique in having a path all the way around its boundary. If correctly marketed this should bring massive social and economic benefits to both individuals and communities in Wales.

### In a UK context

The Wales Coast Path will be 870 miles in length and together with Offa's Dyke will create a massive 1,027 mile trail. This will provide a substantial challenge to long distance walkers and yet it will create opportunities for the less adventurous, and for young families to enjoy a day out or a holiday destination. The following selection of well known long-distance trails will give an idea of how our new coastal path compares. All the distances are approximate and in many cases walkers vary their routes:

| | |
|---|---|
| South West Coast Path | 630 miles |
| Cambrian Way | 274 miles |
| Pennine Way | 251 miles |

| | |
|---|---|
| Wainwright's Coast to Coast | 183 miles |
| Glyndŵr's Way | 135 miles |
| The West Highland Way | 96 miles |

The last of these attracts about 50,000 people a year and is well provided with both a transport infrastructure and accommodation facilities; there is no reason why we in Wales cannot compete with such an attraction. We do, however, need local businesses to understand the new opportunities being created for them as indicated by the following extract from Guardian Unlimited:

*'Alfred Wainwright's coast-to-coast walk has brought unexpected prosperity to backwaters whose economies have long been on the back foot.'*

The coastline in Wales is one of our hidden gems and little known to visiting walkers, apart, perhaps, from the section in the Pembrokeshire Coast National Park. I know our Ramblers President in Wales, Jane Davidson, would argue strongly that her 'home' stretch near St Dogmaels beats all the rest whereas I naturally favour my local section from Criccieth to Porthmadog. I am inspired by the dramatic views across the bay towards Harlech and the Rhinogydd and later, as we follow the Afon Glaslyn, the views of Moelwyn Bach, Y Cnicht and Yr Wyddfa. However, we are all looking forward to venturing onto new territory in the coming years.

By the way, the Westminster Government seem to be dragging their heels and there is little news of progress with the England coastal path!
**Denis McAteer, Chairman of Ramblers Cymru**

Denis will be leading a walk from Criccieth to Porthmadog on May 5th and other walks will be taking place all around the coast. You are very welcome to join. Go to the Ramblers Cymru website to register your interest. www.ramblers.org.uk/wales

## Llwybr Arfordir Cymru

Ar 5 Mai 2012, Cymru fydd yr unig wlad yn y byd â llwybr arfordirol di-dor, yn ymestyn 870 o filltiroedd o Gaer i Gas-gwent. Mae'n cysylltu â Llwybr Clawdd Offa gan greu cylchdaith o 1027 o filltiroedd - llawer hirach nag unrhyw lwybrau pell eraill yn y DU. Dylai roi hwb sylweddol i fusnesau twristiaeth ar hyd yr arfordir a bydd yn gyfle gwych i ymwelwyr a'r brodorion wneud ymarfer corff a mwynhau ein glannau godidog. Wrth greu'r llwybr, bu ymdrech arbennig i beidio ag amharu ar y safleoedd bywyd gwyllt mwyaf sensitif.

Michael D Smith

# The Brecon Beacons National Park - *biodiversity challenges*

***The whole point of being designated a National Park is to conserve and enhance the natural beauty, wildlife and cultural heritage found there. There should be little need, then, to justify the importance of biodiversity conservation in these areas.* PAUL SINNADURAI *looks at some new (and old) challenges facing the Brecon Beacons.***

Conserve and enhance natural beauty, wildlife and cultural heritage; provide opportunities to the public for the understanding and enjoyment of the parks' special qualities; conserve biodiversity in ways that foster the social and economic well-being of people who live and work here…

All of the above fall in the remit of what it means to manage a National Park. 'Special qualities' and 'natural beauty' have been defined formally, and encapsulate why the parks are highly valued by the nation, and indeed internationally: the western half of the Park is designated as the Fforest Fawr Geopark, a European and UNESCO designation. There is not sufficient space here to summarise the definitions – you can find them in the Brecon Beacons National Park Management Plan (www.breconbeacons.org), together with an overview of the Park's landscape, natural beauty and the role of the National Park Authority (NPA) and other public bodies entrusted with oversight of its management.

The purposes and duty emphasise the importance of people in the landscape and their dependence on it. It follows that this duty extends to the Park's natural beauty and wildlife (or biodiversity): these reflect nature's response to past events which are recorded in the Park's cultural heritage, geology and geomorphology.

## Biodiversity in the Park

Livestock farming, forestry, registered commons and drinking water reservoirs dominate land-use in the Park and these have, and continue to be, the main human influences on biodiversity, along with residential development and new roads. To the south of the Park lie coal mines, power stations and steel works, all contributing to air and dust pollution and acid rain.

About 21% of the Park's area is designated as SSSI, including 11 Special Areas of Conservation, but there are no Special Protection Areas or Ramsar Sites: absence of these designations suggests that there is room for improvement in the bird world here. The 2005 State of the Park report stated that, based on a sample of sites, 70% of the SSSIs in the Park were in an unfavourable condition. About 14% of the uplands are owned either by public bodies, statutory bodies or the National Trust. The NPA itself is the largest landowner in the Park, with most of this being registered common land where commoners exercise their rights (three of Wales' four blocks of contiguous common land of over 4000 hectares fall within the Park). By 2008, about 17% of farmland was entered into a Tir Gofal agreement.

## Biodiversity highlights

- Largest breeding and hibernating colony of lesser horseshoe bats in northern Europe; healthy populations of dormouse and otter; recent re-introductions of water vole; most of Wales's remaining herds of registered semi-feral Section A Welsh Mountain ponies.
- Wales's southernmost population of red grouse; one of the best sites in south Wales for breeding and passage migrant birds at Llangorse Lake (also SAC); nightjar benefiting from regular clear felling on plantations.
- Over 70% of Wales' carboniferous limestone pavement; one of the best and largest examples of a raised bog (Illtyd Pools SSSI); a rich concentration of waterfalls in Waterfall Country; some of Wales' deepest and longest caves; large but impoverished expanses of wet and dry heath and blanket bog.
- Rare and indigenous whitebeam, including Ley's whitebeam (*Sorbus leyana*) and lesser whitebeam (*Sorbus minima*); red wood ant in the Abergavenny Woodlands.

Tim Rich

Lesser whitebeam *Sorbus m,inima*

Jon Rothwell

Red wood ants

- The source of more than 25 rivers that flow through and supply drinking water to the south Wales area. The River Usk and several of its tributaries, as well as the Taf Fawr and Taf Fechan, are impounded with reservoirs along their length to guarantee this water supply.
- Lampreys, bullhead, salmon and trout in the Usk and Wye; twaite and allis shad.

## Challenges

The challenges for conservation are varied, including the lasting combined effects of historic industrial pollution and overgrazing on large areas of common land, coupled with the recently superimposed effects of localised undergrazing due to the declining number of active commoners. Other challenges include:

- making a viable living from food production in hill farming and the alternative contribution that farming can make to society from high nature value farming
- bracken encroachment onto the open hill interfering with grazing, livestock movements and ecology
- meeting the growing challenge of upland erosion caused by a combination of factors that are exacerbated by changing weather patterns
- understanding what catchment management means in practice for soil, water and carbon conservation
- riverbank erosion, invasive alien plants, the increasing incidence each year of wildfires on open moorland, the renewed urbanisation and industrialisation of the fringe beyond the Park's southern boundary
- the likely and compounding effects of climate change on all of the above.

The agenda for biodiversity conservation in the BBNP has expanded as we respond to climate change. Supplies of international commodities such as fossil fuels, phosphorus and metal ores are in decline, and the fallout from this will affect all aspects of life, including the economy and management of Wales's biodiversity. The switch to localised sources of renewable energy will affect biodiversity conservation just as much as the existing causes of habitat fragmentation and disturbance already do. And what of the fact that Wales has been recording below-average annual rainfall levels for a number of years, which in turn affects soil moisture, groundwater recharge and the duration of river low-flows? (Go and look at the National River Flow Archive datasets to see the evidence.)

Gareth Ellis

Limestone pavement at Ogof Ffynnon Du NNR

Interestingly, and perhaps worryingly, the government's Living Wales programme and the Sustaining a Living Wales green paper are strong on responding to biodiversity conservation and climate change, but weaker on ringing the changes in response to these declining resources.

So an additional challenge is to understand these new factors on top of the existing ones. We need evidence, from research and collaboration, to decide what to do about them and what to advise others to do. In the meantime we continue with the conservation projects we're already involved in: protecting and restoring eroding peat bogs and wet heath; carrying out controlled burns; installing bird hides; clearing ditches and scrub; and grappling with the ongoing restoration and aftercare on an oversized gas pipeline. We support projects such as the Wye and Usk Foundation and the Vincent Wildlife Trust's Beacons for Bats, and work with local groups, commoners' associations, and many conservation organisations in the Park. We also support and advise landowners and planning applicants on how to help wildlife. The changing world throws up new dilemmas: we continue to champion biodiversity whilst trying not to fall behind with the skills that these new challenges require.

***Paul Sinnadurai** is the Senior Ecologist and Policy Advisor for the Brecon Beacons National Park Authority and a member of NATUR. The views and opinions expressed in this article are his own and do not necessarily reflect the views of these organisations.*

Darren Fach

*Sorbus leyana*

## Heriau'r Bannau

Mae gan Barciau Cenedlaethol ddyletswydd i warchod bywyd gwyllt a thirweddau o fewn eu ffiniau, a hybu lles pawb sy'n byw a gweithio yno. Mae Bannau Brycheiniog yn llawn ffermydd, coedwigoedd a chominau cofrestredig, a chronfeydd dŵr gyda thros 25 o afonydd yn cyflenwi dŵr yfed i'r De. Mae cyfoeth o fywyd gwyllt yn y Parc, gan gynnwys y gytref fwyaf o ystlumod pedol lleiaf yng ngogledd Ewrop ac enghraifft wych o gyforgors ym Mhyllau Illtud sy'n safle o ddiddordeb gwyddonol arbennig.

Dywedodd adroddiad Cyflwr y Parc 2005 fod 70% o'r safleoedd o ddiddordeb gwyddonol arbennig mewn cyflwr anfoddhaol. Mae'n rhaid rheoli'r parc ochr yn ochr â cheisio ennill bywoliaeth trwy ffermio mynydd, rhedyn yn meddiannu'r tir, problemau erydu, newid yn yr hinsawdd, rheoli dalgylch dŵr, rhywogaethau anfrodorol a thanau gwair. Mae angen i'r Fframwaith Amgylchedd Naturiol ymateb i dranc mwynau rhyngwladol, a newid i ffynonellau ynni adnewyddadwy lleol, a fydd yn cael effaith anorfod ar warchod bioamrywiaeth. Mae angen i ni ddeall y ffactorau newydd hyn ac ymchwilio i'r dystiolaeth er mwyn penderfynu pa gamau i'w cymryd.

Crown copyright (2012) Visit Wales

# Living Wales - *what do you think about it?*

A complex array of habitats in the Vale of Ffestiniog

***The Welsh Government has recently launched a green paper titled 'Sustaining a Living Wales' with the consultation period running until 31st May 2012. What does it all mean? What is an ecosystems approach?*** ***HUW JENKINS*** ***provides a personal overview. It would be good to see*** **Natur Cymru** ***readers engage with this consultation. Speak NOW or forever...***

Janez Potočnik

*"Resource efficiency is not a choice, it is inevitable. Our choice is whether to develop it now, or whether we wait until we are forced to when critical resources are exhausted and expensive. During the 20th century the world population grew four times, its economic output 40 times. We increased our fossil fuel use 16 fold, our fishing catches by a factor of 35 and our water use 9 fold. It was called the "great acceleration", but I am afraid that we might hit the wall soon. The "business as usual" scenario tells us that we would need three times more resources by 2050. But already 60% of the world's major ecosystems on which these resources depend are degraded or are used unsustainably. So "business as usual" is not an option.*

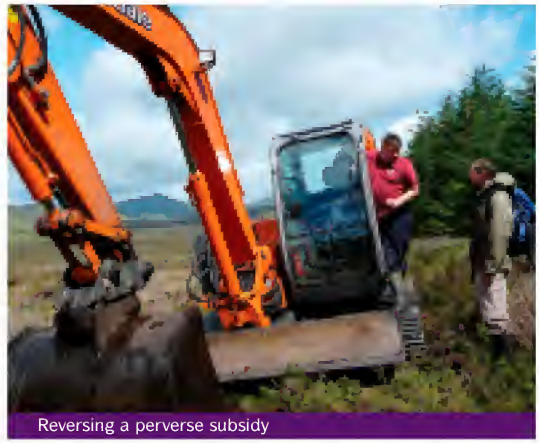
Janez Potočnik, European Commissioner for the Environment, 12th December 2011.

Here in Wales we recently took part in the UK assessment which showed a much better situation with a mere 30% of our ecosystems damaged! That's the wake-up call, now we need action and the Living Wales[1] programme may yet save us from ourselves. But what is it?

To get a layman's overview I have spoken with a number of people, one of those being Shaun Russell, Director of the Wales Environment Research Hub: "In simple terms Living Wales is a way of looking more deeply into all aspects of the environment and long term. How we can maximise benefits for people in terms of jobs,
livelihood and health."

Living Wales embraces an 'ecosystems approach' which is a way of looking at what nature provides for us with examples being: water quality, water storage, flood control, carbon storage, biodiversity of plants and animals and so on. The essence of the approach is not to look at one or two aspects in isolation but to look at the big picture, at a basket of potential benefits.

An example in Wales where we have not looked at the big picture would be encouraging farmers to dig ditches and drain the uplands to create more pasture for grazing sheep. The consequences were the drying of the peat, reduction in biodiversity, loss of carbon into the atmosphere, flooding and discolouration of water costing water companies a lot of money to treat. Even the farmers were complaining about



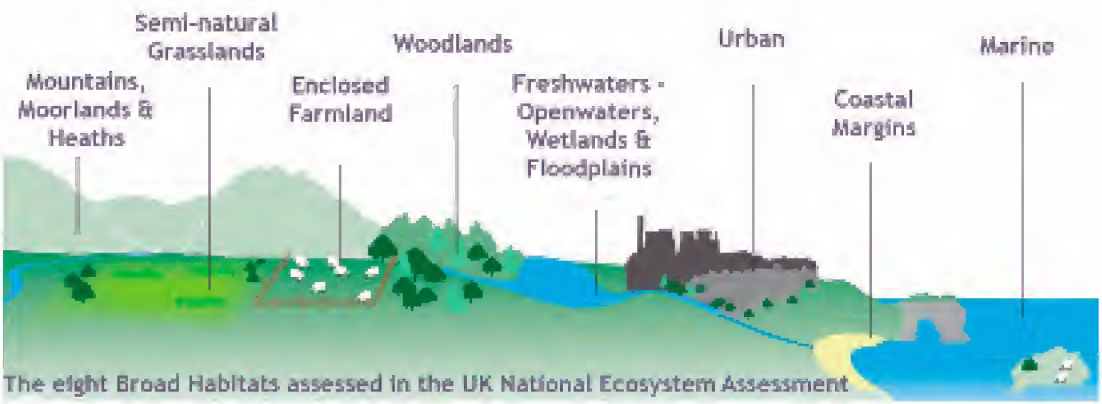
Huw Jenkins

Reversing a perverse subsidy

sheep perishing in huge ditches from which they could not escape. With hindsight we realise this was wrong and are now blocking those ditches to re-wet the uplands; reversing a perverse subsidy.

The ecosystems approach is not something we have invented in Wales but an approach developed through parties to the Convention on Biological Diversity (CBD) and adopted across the world by 190 countries. The approach is based on a set of twelve complementary and interlinked principles of which the first three are:

1) the objectives of management of land, water and living resources are a matter of societal choices;
2) management should be decentralized to the lowest appropriate level;
3) ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.




The eight Broad Habitats assessed in the UK National Ecosystem Assessment

Martin Cavaney

Pembroke Power Station

### What are ecosystems?

Article 2 of the Convention defines an ecosystem as "...a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit." Standing outside Plas Tan y Bwlch I asked Shaun what ecosystems could be seen in the Vale of Ffestiniog: "Ecosystems is a posh word for habitats and here we have the full set: montane (mountains, moorland and heathland), arable farmland, semi-natural grassland in y ffridd, woodland, wetlands including the river itself, salt marshes leading to marine habitat and of course urban – towns and villages. All habitats provide benefits and services."

Wales is at the forefront of converting the approach into action with the launch of its green paper, just a step along the way leading to a white paper and an environment bill in 2015. "Wales might be a small country, a drop in the ocean of a seven billion population, but by leading the way we hope to influence people around the world." Testimony to this is the delegation from Wales which has been invited this spring to the Indian state of Maharashtra, with its population of 120 million, to advise on how to conduct an ecosystems assessment.

### Planning is key

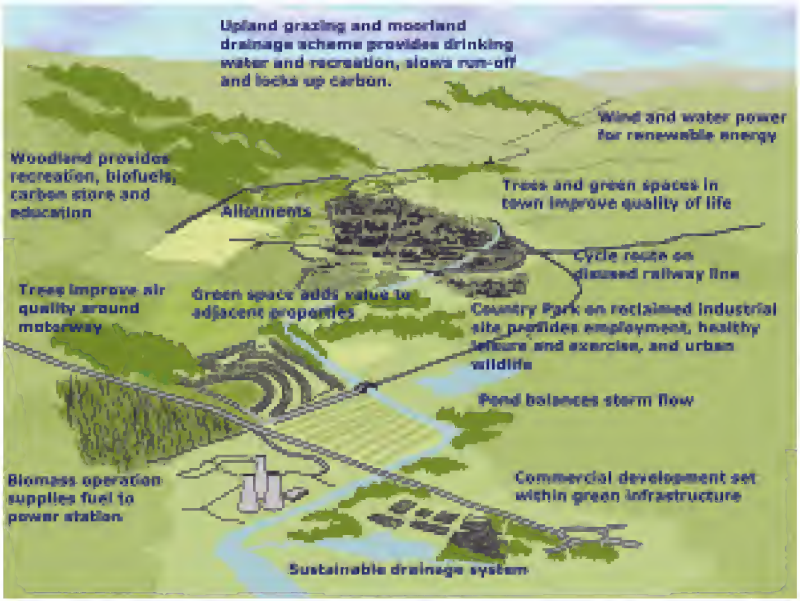
Planning guidelines and regulations are the principal mechanisms for driving change, with a sustainable development bill and a planning bill in the legislative pipeline. I spoke with people involved in the planning process. One said 75% of his time he finds himself saying no, but he hopes this paradigm will change with Living Wales, enabling and encouraging the right sorts of development in the right place rather than him having to be the environmental policeman. "So often development plans (buildings, roads, power stations etc.) are presented with environment aspects left to the end. If environment can be built in from the start, there will be less need for U turns at the last minute or costly alterations. Show stoppers can be identified early on before it's too late."

At present developers might need to get approval from several organisations and this is something that should be streamlined or made simpler with the creation of the Single Body[2]. This unified body, together with the ecosystems approach, should help avoid anomalies such as Pembroke Power Station. Building plans were approved and work started in 2009. In November 2011 the Environment Agency granted an environment permit. On the same day the Countryside Council for Wales was pointing out on national TV that releasing 3.5 million cubic metres per day of hot (8° C warmer) water into a marine Special Area of Conservation was bound to affect the ecology and therefore be in breach of European law. Having spent a billion pounds it was a bit late to consider moving the power station!

Under Living Wales would we have agreed to the gas terminal at Milford Haven and the pipeline that went through the Brecon Beacons? Would the HS2 high-speed railway between London and the Midlands be in accordance with the principles?

Living Wales is intended to be at the heart of development thinking, getting an appropriate balance between environmental and socio-economic factors. Embracing the principles should guide us to work with nature rather than against it.

It all sounds great and whilst most people seem enthusiastic there are concerns. Some environmentalists fear that our shrinking conservation budgets and management focus will switch to the new at the expense of the old e.g. away from the 74 National




Nature Reserves. Industrialists might fear tightening controls and higher costs whilst many farmers see it as yet more environment legislation on top of their primary role to produce food. People living behind man-made sea defences might worry what 'working with nature' could mean to their predicament.

The 'Sustaining a Living Wales' green paper sets out the proposals with the consultation running until 31st May 2012. It seeks views and ideas on our level of appetite for 'radical' change. The 38 page document is well presented with a structured set of questions at the back in case you need a prompt.

There is also an offer on the government website to attend meetings and events to hear your views and provide updates - the email address is LivingWales@Wales.gsi.gov.uk

To access all relevant documents visit www.wales.gov.uk/living-wales but be warned that 'Living Wales' was the name of a previous consultation whereas the current one is 'Sustaining a Living Wales'.

***Huw Jenkins** is the marketing manager for* Natur Cymru *and a community reporter for Radio Wales. He gives talks to groups and societies across north and mid Wales in return for them buying subscriptions to* Natur Cymru.

1. 'Living Wales' is the name of the government programme overseeing the green paper and the creation of the Single Body (see below). 'Sustaining a Living Wales' supersedes the term 'Natural Environment Framework' (NEF).
2. The Single Body, previously referred to as the Single Environment Body, will be a completely new body that will have responsibility for much of the work that is currently done by Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. The new Single Body should be in place by April 2013.

## Cymru Fyw – beth yw eich barn chi?

"Yn ystod yr ugeinfed ganrif cynyddodd poblogaeth y byd bedair gwaith drosodd a thyfodd y cynnyrch economaidd 40 gwaith drosodd. Mi ddefnyddion ni 16 gwaith yn fwy o danwydd ffosil, mi ddalion ni 35 gwaith yn fwy o bysgod ac mi ddefnyddion ni 9 gwaith yn fwy o ddŵr. Roedd yn gyfnod o ffyniant mawr, ond rwy'n ofni bod chwalfa ar y gorwel." Janez Potocnik, Comisiynydd Ewrop dros yr Amgylchedd.

Ymateb y byd yw ceisio rheoli'r amgylchedd ar lefel yr ecosystem, ac ymddengys fod Cymru'n arwain y ffordd drwy lansio papur gwyrdd 'Cynnal Cymru Fyw', sy'n troi bwriadau da'n weithredu go iawn. Ond beth mae rheoli'r amgylchedd ar lefel yr ecosystem yn ei olygu? Yn syml, mae'n wahanol i ddulliau'r gorffennol gan ei fod yn ystyried pob agwedd ar yr amgylchedd yn yr hirdymor. Bydd y dull yn cael ei roi ar waith trwy gyfrwng y broses gynllunio, gan sicrhau bod yr amgylchedd yn cael sylw o'r cychwyn cyntaf yn hytrach na chael ei ystyried tua diwedd y broses yn unig. Ewch i www.wales.gov.uk/livingwales i weld yr holl ddogfennau a chymryd rhan yn yr ymgynghoriad.

*Brecon Beacons New Naturalist*
**UPDATE:**
Even if you know an area well producing a regional volume for the New Naturalist series constantly unearths new material, much of it never published before, and that inevitably changes your view of the chosen locality. For me the Beacons will always be a landscape of wide sweeping vistas, expansive tracts of common land and waterfalls tumbling over the limestone, but, after nearly eighteen months research, it is now also a land of mosses and liverworts, whitebeams, fossil plants and fish and countless rare invertebrates. That depth and detail is both reassuring and humbling. Deep and detailed ecosystems, and indeed their continuity, are the keystones of a healthy environment and such places need ever more protection in our increasingly uncertain world.

We are very fortunate therefore that there are so many people interested in the natural history of the Beacons and, importantly, willing to give their time, both paid and unpaid, towards the conservation of this fascinating region. Quite a few of these people have also kept me well provided with information on their specialisms and supplied stories, as I requested in Natur Cymru (Summer 2010), which highlight the excitement of finding and observing species in the area. In these days of biodiversity action plans, species recovery targets and other well-meaning administration systems it is all too easy to lose sight of why we first became interested in natural history and began to understand its importance. If you have information you would like included in the book, or experiences of wildlife in the Brecon Beacons which you think would be of interest please contact me at: naturalist@zoho.com

**Jonathan Mullard**

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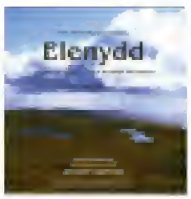



*Elenydd*
***Lluniau a thestun / Photography and text - Anthony Griffiths***
***Gwasg Carreg Gwalch 2010***
***96 pages £12.00***

To see a book entitled *Elenydd* is a huge relief: its welcome production fills a gaping hole on our bookshelves. Through evocative photographs and succinct inspirational accompanying text, Anthony Griffiths takes us on a journey across one of the least reported landscapes of Wales, the Cambrian Mountains, and puts this 40 mile stretch of Wales' backbone into the psychogeography of our country.

The unique qualities of *Elenydd* are the sense of tranquillity and unfragmented far horizons, which the photographs capture masterfully. They provide a rich biography of the landscape, studded with streams, waterfalls and lakes, through the seasons: from winter at Ystrad Fflur to the heather moors at Glaslyn and Soar y Mynydd in autumn. The accompanying bilingual text complements the images with detailed facts and mythology. The information is rich in historical and cultural knowledge, from the paw prints of King Arthur's dog, Cabal, on Carn Gafallt, to the hoof prints of Owain Glyndŵr's horse at Craig-y-march. Elenydd's wealth of prehistoric and historic features that might otherwise be missed is usefully archived.

The significance of the Welsh language within the landscape is carefully portrayed. Even if you do not understand the Welsh names, which are often descriptively evocative, the written words provide a strong sense of place, which, with the addition of the grid references, encourages the reader to find the locations. This core area of Wales has been ignored by the landscape designation procedures. The lack of iconic peaks; the division of Elenydd between three counties; the comparative absence of roads, meaning out of sight, out of mind – these are some of the reasons that have contributed to this vulnerability.

The clumsy, short-term, profit-chasing land uses of the 20th century - blanket afforestation, wind farms and 4x4 vehicles – have eroded some of Elenydd's landscape character and community resilience. The only distinctive, but now defunct, landscape-scale initiative was the Cambrian Mountains Environmentally Sensitive Area scheme.

Let us hope that *Elenydd*, by capturing the musicality of these mountains, will contribute to more visionary, long-term community, environment and landscape outcomes in the 21st century. The book is a long awaited celebration of this ancient heartland of Wales.

**Liz Fleming-Williams**

# Capel Horeb Quarry - the oldest vascular tissue evidence in the world

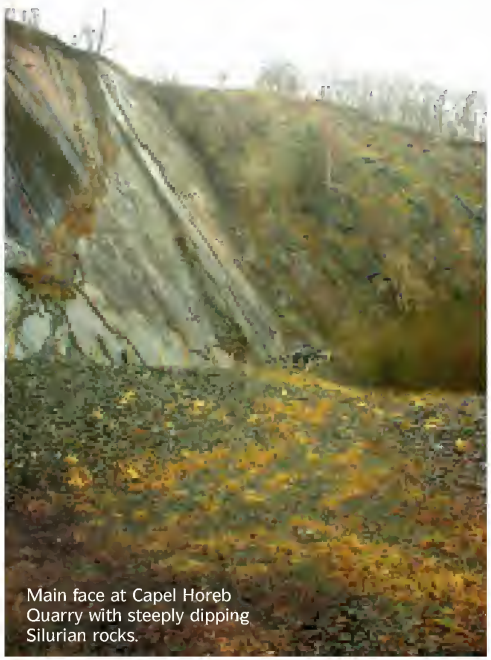
For most of the Earth's 3.5 billion year history, life was mainly restricted to the sea. During this time the land surface would have been a barren and forbidding place, providing little food or protection for any organism trying to live there.

Things started to change in the Silurian Period, about 430 million years ago, with the appearance of the first land plants. These were delicate organisms, often only a few millimetres tall, but remarkably their remains have been found in Silurian rocks in many places across the world. Wales has been a particularly important place for their study as these early plant fossils are often abundant and well preserved here. Consequently, British palaeobotanists have been at the forefront of studies on early plants, in recent years most notably Professor Dianne Edwards of the University of Cardiff.

Amgueddfa Cenedlaethol Cymru / National Museum Wales

*Steganotheca striata Edwards*. Small spore-bearing sacs were borne at the ends of slender forking stems. Scale bar = 10 mm.

Vascular tissue was a key evolutionary innovation that helped plants adapt to life on land. So long as they were growing immersed in water, moving fluid around the plant was not a problem. But as soon as they were growing on land, plants needed vascular tissue to transport fluids obtained from the rooting structures in the ground to the rest of the organism. Consisting partly of thick-walled cells, vascular tissue also provided support to the stems, helping plants grow larger. The first appearance of vascular tissue was therefore an important part of the history of the move of life onto land.



Amgueddfa Cenedlaethol Cymru / National Museum Wales

Main face at Capel Horeb Quarry with steeply dipping Silurian rocks.

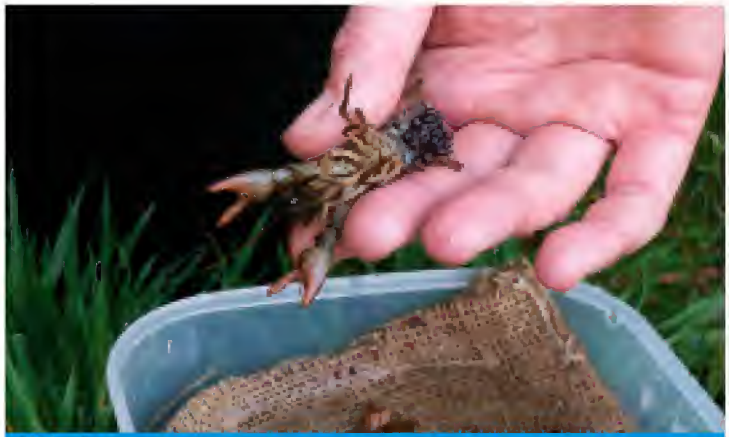
A particularly important site is Capel Horeb, an old, disused quarry near the northern edge of the Brecon Beacons National Park. Like many other exposures of Silurian rocks in Wales, it yields fossils of early plants such as *Cooksonia* and *Steganotheca*. Importantly, however, Dianne Edwards found here tiny stems preserving the faint remains of vascular tissue – the oldest evidence of such tissue from anywhere in the world.

For many years the ownership of Capel Horeb Quarry was in doubt. Consequently, although it had been designated an SSSI for its palaeontological interest, its long-term conservation was uncertain. Recently, through a grant from the Aggregates Levy Sustainability Fund for Wales, the site was acquired by the British Institute for Geological Conservation (BIGC) and this has secured its long-term future. The BIGC aims to protect the site for future research but is also developing on-site interpretation for educational purposes. To obtain permission to access the site, contact the Treasurer of BIGC, Prof. Barry Thomas (bat@aber.ac.uk).

***Dr Christopher Cleal** is Head of Vegetation History, Dept. of Biodiversity, National Museum Wales, and Secretary of the BIGC.*

## Crayfish at Cynrig

The rearing and stocking of salmon has long been (and still is) bread and butter work at the Environment Agency Wales's Fish Culture Unit at Cynrig. However, workers at this hatchery, hidden away on the beautiful northern edge of the Brecon Beacons National Park, have more recently had other fish to fry…



Oliver Brown

White clawed crayfish, berried female

In fact this newest conservation action doesn't involve fish, rather other declining and vulnerable species dependent on our freshwater habitats. The latest species to have benefited from the EA staff's husbandry skills are pearl mussels, water voles, and white-clawed crayfish, a species now under serious threat.

The white-clawed crayfish, *Austropotamobius pallipes*, is our only native crayfish and has a Welsh distribution largely confined to the southeast, including the Wye, Usk and some of the Valleys rivers. Populations have crashed in the last three decades, locally and globally, and the International Union for Nature Conservation (IUCN) has recently elevated the species' status from 'threatened' to 'endangered'.

Habitat loss, siltation and pollution, in particular from banned sheep dips, are factors likely to have been responsible for much of their decline in Wales. Tackling these issues is a high priority for EAW – clean freshwater ecosystems are valued by wildlife and humankind alike, and the Water Framework Directive obliges us to ensure our waters meet high standards.

For white-clawed crayfish, however, one threat looms large above the others and is seemingly unstoppable – that of non-native crayfish and 'crayfish plague', a disease which they carry. These introduced crayfish, found at increasing numbers of sites in Wales, consistently out-compete white-clawed crayfish to extinction. Crayfish plague is a fungus-like disease which is lethal to native crayfish and will quickly decimate a population. To make matters worse, provided the fungal spores remain damp, the disease can be transferred by animals and humans to catchments even where non-native crayfish are absent.

Eradication of non-native crayfish in flowing waters is in most cases likely to be impossible. Most experts also agree that trapping non-native crayfish has little impact and that it can make matters worse by increasing biomass and increasing the risk of spreading non-native species and crayfish plague.

Without conservation action white-clawed crayfish will continue to be lost and will be at risk of extinction within the next 20-30 years.

The Environment Agency's crayfish conservation strategy over the next decade includes protecting, as much as possible, existing native crayfish populations, and establishing a collection of safe havens for them, also known as 'ark sites'. White-clawed crayfish will be needed to stock the new ark sites but with few, if any, naturally abundant populations suitable for harvesting in Wales, captive rearing is likely to be the most efficient way of providing crayfish for stocking.

Past attempts at rearing native crayfish have for the most part been met with limited success: however, recent work to do the same at Cynrig has been successful beyond all expectation.

**Captive rearing crayfish**
Work to investigate the viability of captive-rearing juvenile white-clawed crayfish at Cynrig started in 2009, and the first system for maternal incubation was trialled in 2010.

**Culture methods**
The incubation system was constructed from two 1m circular holding tanks, a pump and header tank. Water was sourced from a borehole supply and the temperature kept at a minimum of 0.5°C and allowed to rise to no more than 13.5°C. Ultra violet filtration was used to preserve water quality and reduce the prevalence of pathogens.

In 2011 a larger system was constructed in a purpose-built insulated building giving the potential to rear in the region of 1000+ juveniles. Similar measures to maintain water temperature and quality were incorporated.

**Broodstock**
Relevant licences were obtained from Natural England and Countryside Council for Wales. Berried females were taken by hand and transported in small amounts of water in sealed containers with a hessian cloth substrate and air holes. No more than two females were transported in each container, in which the temperature was maintained at <12°C through packing with ice in polystyrene boxes.

On return to Cynrig, temperatures were equalised between transport containers and holding tanks to prevent any thermal shock. Animals were then transferred to chosen tanks. Refuge was provided for the adult females in the form of small plastic pipes. They were fed twice weekly with a mixture of cat food, bloodworm and mixed vegetable matter.

Oliver Brown

Recently hatched stage 1 juvenile

**Juvenile Culture**
Over the course of 2010/2011 a number of different types of rearing substrate were trialled using a mixture of gravel and artificial salmonid hatching substrate. To ensure any hatching juveniles had sufficient food, live artemia were fed sparingly every two days as of early June. During early July, when independent juveniles were spotted in the tanks, feeding was stepped up to a daily ration of artemia along with frozen cyclops.

Oliver Brown

Juveniles ready for release

Shortly after the juveniles were spotted, the adult females were removed to prevent maternal cannibalisation, and subsequently returned to their stream of origin. As the juveniles grew, the artemia were replaced by daphnia and different sizes of bloodworm.

**Conclusions and next steps**
Survival of juveniles was much higher than expected and in November 2010 fifty juveniles were stocked into a southeast Wales stream to mitigate for broodstock collection. In May 2011 a further 200 juveniles were released at a new 'ark site' in conjunction with Buglife, The Invertebrate Conservation Trust.

The work in 2011 was carried out in partnership with the Wye and Usk Foundation as part of the Irfon Special Area of Conservation Project. The first restocking into the Irfon catchment is planned for Spring 2012, with a further two rearing cycles planned. We hope to stock in excess of 1000 juveniles annually.

EAW Biodiversity officers are currently leading the work to identify and cultivate potential ark sites as recipient waters. Post release, a monitoring plan will be put in place to determine the success of any introductions. This is, however, still only a small part of the work taking place to mitigate against the threats facing the white-clawed crayfish.

***Catrin Grimstead,** Biodiversity Officer, and Oliver Brown, Fish Culture Officer, with Environment Agency Wales*

## Phytophthora in Wales

*Phytophthora ramorum* is a fungus-like pathogen that causes extensive damage and mortality to trees and other plants. In 2010 it was found on Japanese larch (*Larix kaempferi*) in south Wales, predominantly in Welsh Government woodlands managed by Forestry Commission Wales near Port Talbot, Bridgend and in the Vale of Glamorgan. It has since been found in small pockets in mid and north Wales in both public and private woodlands.

In 2010 a total of 876 hectares was found to be infected and as a result felled – this included nearly 200ha of young trees under 15 years old. In 2011 a further 545ha were identified as infected, but these were mostly associated with previously known infections. This suggests that, in addition to other bio-security measures being put into place, felling the infected trees in 2010 may have gone some way to control the spread.

First identified in the UK in 2002, in a viburnum plant in a garden centre in West Sussex, *P. ramorum* was initially found infecting mostly shrubs such as rhododendron, camellia and viburnum. In 2009 it was found infecting and killing large numbers of Japanese larch in southwest England. This was the first time in the world that *P. ramorum* had infected and sporulated on commercially important conifer species.

> In the Brecon Beacons three sites were confirmed as infected in 2011 – Glasfynydd Forest near the Usk Reservoir (1ha), Penmoelallt near Merthyr Tydfil (6ha) and another at Storey Arms on the A470 (6ha). Prior to that the only known case was at the Garwnant Visitor Centre (16ha under notice but only six infected trees felled).

Throughout the year, but predominantly in autumn, infected trees produce huge quantities of spores that enable the spread of ramorum disease. Tree mortality can be rapid – *P. ramorum* appears to be able to kill large numbers of Japanese larch within one growing season after its detection, which, compared with other tree diseases, is fast acting. In Japanese larch it causes shoot tips to wilt and needles to turn brown and fall prematurely. Cankers that bleed resin can appear on the branches and upper trunk.

In common with other spore producing organisms, the weather plays a critical role in the spread of ramorum disease, as zoospore survival rate is much higher during damp conditions, living for up to two days. Additionally vectors such as wild animals and people can also spread the spores.

Although the majority of spores produced are zoospores, *P. ramorum* also produces very long lived chlamydospores: whilst not so mobile, they can persist in the soil for many years.

FCW

Phytophthora infection

Forest Research scientists have advised that the most effective means of preventing its spread is to fell infected trees to kill the living material on which the pathogen depends. This is being followed and, once identified as infected, there is a statutory obligation for owners to fell the trees.

The spread is being monitored by aerial and ground surveys but during the winter, once the larch have dropped their needles, it is impossible to identify symptoms of the disease. This spring, once the trees have flushed with new needles, surveys will get underway again. It is hoped that the extent and spread of infection will reduce again.

In Wales there are 22,400ha of larch, which is around 8% of all woodlands. In addition to being a valuable source of timber, as they are deciduous, they are an important feature in the landscape.

***Owen Thurgate*** *Phytophthora Project Manager, Forestry Commission Wales*
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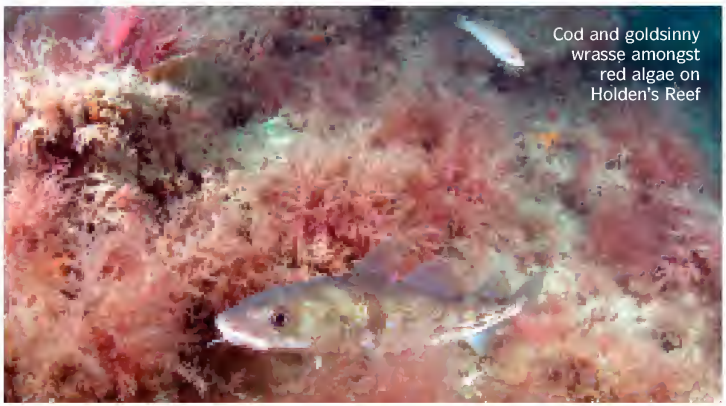
## Bubbling reefs

Among significant marine ecological discoveries in the last half century were the life forms and whole ecosystems fuelled by geochemical energy sources. Black smokers in the deep sea are spectacular examples, where microbes exploiting the chemicals in hot water from within the earth's crust are the basis of complex food webs. At a few locations off Wales methane bubbling from under the seabed is used by methanotrophic bacteria. A byproduct is precipitation of carbonate, so that sand is cemented together. Over time this Methane Derived Authigenic Carbonate (MDAC) can build up reefs. The shallowest such 'bubbling reef' known round Britain is in Cardigan Bay off Barmouth, named Holden's Reef after the diver who first noticed bubble streams coming from seabed rocks. An obstruction had been recorded near here by Admiralty surveyors in the late 19th century, though old charts show it not at precisely the same spot so there may be other concretions now under the sand. Holden's Reef attracts a diverse fauna and flora attaching to it, and in crevices, that are not present on the surrounding sand. Interestingly, more fish have been seen around it than at ordinary rock outcrops of comparable size. 'Bubbling reefs' are listed as a Priority Habitat under the Habitats Directive.

In deeper water, just beyond the mid line with Ireland, there are other MDAC concretions. These lie along the line of the Codling Fault, running south-eastwards across the Irish Sea



Cod and goldsinny wrasse amongst red algae on Holden's Reef

Rohan Holt

from off Dublin. Known as the Croker Slabs, after the Irish petroleum geologist who identified them, they have been bored by bivalves and other marine animals, giving extra habitat complexity to very jagged surfaces. The methane leaking through fissures to the seabed on the Codling Fault probably comes from carboniferous coal measures. In Cardigan Bay the origin of the gas is not known, though it could be from peat or other organic deposits overwhelmed by rising sea levels after the last glaciation.

There are much more extensive areas in our seas where gas is trapped as small bubbles within recent fine sediment. Sound reflects from gas bubbles, and this causes a phenomenon known as acoustic turbidity, or blanking. The underlying, more solid strata (which would normally be detectable by low frequency sonar systems) are concealed below the mass of reflections. Tremadog Bay shows prime examples of acoustic turbidity. After the last glaciation there was probably a large lake here in a basin scoured down to at least 70 metres below the present seabed. It seems to have filled quite rapidly with fine sediment containing organic matter, producing methane as it decayed. Acoustic turbidity thus made it difficult to chart the extent and shape of the basin. To the northwest of Anglesey and southwest of the Isle of Man there is an even larger area of gassy fine sediment. Sonar records also show plumes within the sediment where gas is migrating towards the surface and pockmarks where escaping gas created pits in the seabed. As with bubbling reefs, video observations show that pockmarks can be biodiversity hotspots, with prawns and fish congregating in them. With controversies over fracking, to release gas from shale, and in situ gasification of sub-sea coal seams, this is an appropriate time to remember that some specialised ecosystems also exploit sub-sea gas as an energy source.

***Ivor Rees*** *is a marine biologist and formerly was senior lecturer in Ocean Sciences at Bangor University.*

Anthony Roberts

In Spring 2012 BTO Cymru will run its first dedicated survey, on three of our chat species; the stonechat (a partial migrant – some move south for winter while the rest stay put), and the migrants whinchat and wheatear. These three species are seen, to an extent, as Welsh specialities, and are on every visiting birder's wish list in the breeding season.

Results from the Breeding Bird Survey (BBS) show that across the UK stonechat numbers have fallen sharply after the last two cold winters. The long-term trends for whinchat and wheatear both show declines of over 55%. Whinchats have disappeared from much of their traditional range in Wales, and wheatears are no longer a common breeding bird in some parts.

The BBS is the primary method for monitoring bird populations in the breeding season, with around 250 random squares in Wales surveyed annually by BTO volunteers. An annual BBS index is available for stonechat and wheatear for Wales, but not for whinchat, which now occurs on too few of the squares surveyed each year. A targeted survey is needed to obtain more detailed information on scarcer species, and the habitat features that are most important to them.

The survey will be conducted by volunteers surveying randomly selected 1km squares during three visits in each of April, May and June. The whole square will be covered and all target species plotted on maps. This is going to be an online survey, with a similar feel to existing BTO surveys. If you'd like to take part contact the BTO Cymru office on 01248 383285 or kelvin.jones@bto.org

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